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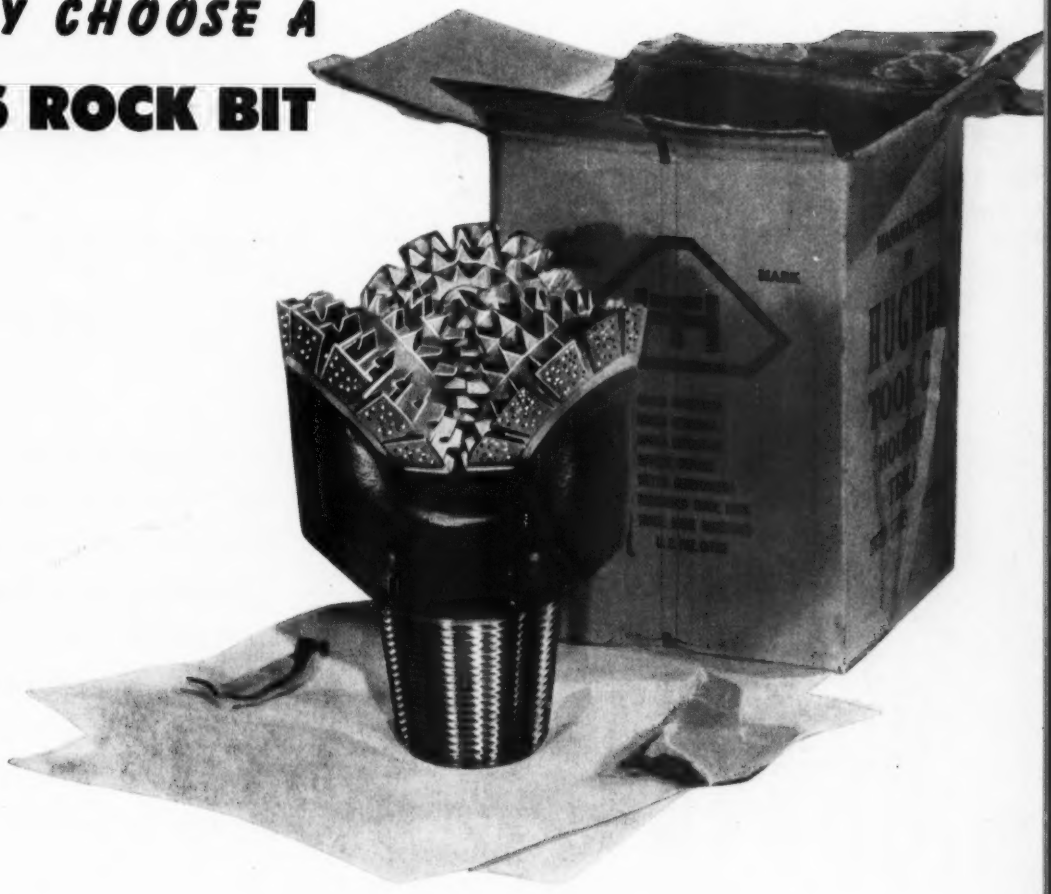

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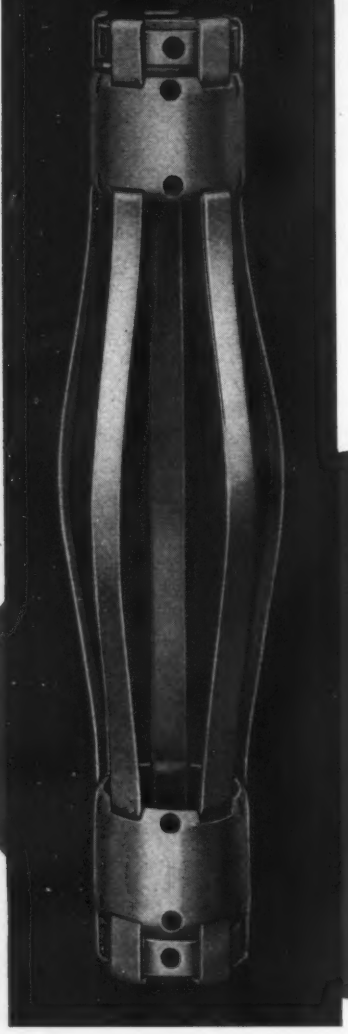

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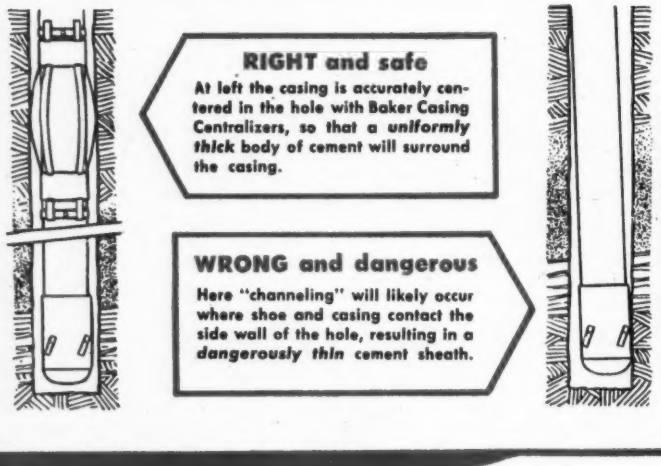
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National Security

RECENT developments in pending tideland matters reveal how quickly Congress and the daily press can become confused as to the issues involved in proposed legislation of great national interest.

Taking their cue from testimony of Attorney General Clark and others, some newspaper and radio commentators are now referring to the efforts to reestablish ownership of the tidelands with the states as a "gift" from the federal Government. Others label the plan an "attempted steal" via state ownership directed by large oil interests.

The public does not know that until the Supreme Court decision of last June no one had seriously questioned the right of the states to their tidelands. The highest court's findings, based on national security, reversed a long line of decisions upholding state ownership. All that the states are now trying to do is to secure a return to their position of 9 months ago.

Many subterfuges are being resorted to in supporting the federal Government's position. To impress a Congressional committee Secretary of Interior Krug glibly states that the offshore areas of this country, including Alaska, will produce 100 billion barrels of oil or nearly twice the quantity of oil that has been found in this country after 89 years of operation.

Actually, except for comparatively small proven reserves now under development, no one—not even a Washington expert—knows what the oil potentialities of our tidelands are. Practical operators are aware that costly exploration and wildcat drilling and carefully planned development over a period of years must precede predictions.

A pending leasing and control act submitted under government sponsorship covering offshore oil operations is ambiguous as to terms. The provisions lead to the conclusion that what the Government has in mind is to induce private operators to expend large sums in exploration and drilling, and then if oil in substantial quantities is found, to carry out the usual military policy of "hoarding" for a possible future war.

This typical bureaucratic viewpoint persists despite the experience of two world wars which clearly demonstrated that this country's protection in an emergency does not rest in setting aside possible oil lands or in merely finding the oil, but in a full-scale development of proven areas under operating principles governing private enterprise.

Return of the tidelands to the states is mandatory as provided in a pending bill if their oil reserves are to be determined and made available. The states know what has to be done before private operators will be justified in making the tremendous expenditures required in offshore operations.

National security, in which the Supreme Court was so much concerned in its tideland decision, lies in a recognition of this basic fact and not in the further futile extension of federal ownership and controls applying to our natural resources.

Texans Take Clark's News Quietly, Will Double Efforts for Quitclaim

by Dahl M. Duff

STATEMENTS of U. S. Attorney General Clark before the joint House-Senate judiciary committee have removed any lingering hope Texans may have had that the federal Government would recognize their state's own special claims to its offshore submerged areas.

Clark's open announcement of his plans to sue for the offshore lands "of Texas, Louisiana, and two or three other Gulf Coast states" was received rather calmly in Texas itself last week since the state already is thoroughly aroused over the possibility of federal control.

Prior to the decision of the Supreme Court last June 23 in the California tidelands case, Texas felt particularly secure in its ownership of its offshore lands. Its special status was based on its offshore boundary of three marine leagues or about 10½ miles established when Texas was an independent republic and accepted when it was annexed into the Union in 1845.

The Supreme Court last June ruled that the federal Government has paramount rights in lands seaward of the low-water mark off the California coast. While this decision has been widely criticized as "judicial legislation" and as a move toward "socialization of our natural resources," it has nevertheless cast some doubt on whether Texas could win a suit such as that which Clark is preparing to file.

Quitclaim Essential

Responsible oil-industry sources in Texas feel that the suits which Texas and other Gulf Coast states now face add to the seriousness of the issues now before Congress and make more necessary the passage of the pending bill which would quitclaim the tidelands to the states.

Some possibility is seen that Clark will follow the suggestion of Senator Moore (Rep., Okla.) and postpone filing of the suits until Congress has completed action on the quitclaim bill. Approval of the bill by Congress is expected but the critical question is whether it will be vetoed as indicated by Secretary of Interior Krug and whether there is sufficient support to override the President's disapproval. Enactment of the bill, which would in effect nullify the Supreme Court's decision, would cut the ground from under Clark's plans to sue for the submerged lands on the Gulf Coast.

The particular significance of the entire tidelands controversy to the petroleum industry is in the likelihood that the development of the promising Gulf Coast submerged lands would come under federal control. This was emphasized in discussions of the situation by well informed industry officials in Texas last week.

Leasing Law Feared

Several ways in which the federal leasing law proposed last month by the Department of Interior would deter and retard active development, were pointed out. Among the worst features of the proposed federal leasing system are the indefinite terms and conditions.

The indefinite terms of the federal leases are in the provisions for variable royalty fixed by the secretary of the interior and the Government's right to change the terms of a lease. These provisions particularly operate to discourage capital, since financial planning would be difficult, if not impossible.

In contrast to established state leases, the federal Government has proposed that leases be limited to an initial 64,000 acres and be reduced at the end of the fifth year to not more than 7,680 acres. It was emphasized that development of offshore oil lands in the Gulf of Mexico more than any dry-land operation is a "big-company job" requiring extremely heavy investments. Under the federal leasing plan, the Government could select and keep the best part of a major field discovery which would ordinarily be used by the company to recoup on its outlay.

Another objection raised to the federal leasing bill was in its provisions for control of the oil operation by the secretary of the interior in Washington. This includes the right of the Government to fix the rate of production and lay down other operating conditions. Further tending to discourage large-scale development is the fact that the Government, under terms of the leasing bill, would be permitted to withdraw or hold in reserve any areas which it felt necessary. In addition, the Government reserves the right to take back the property in the event of an emergency, paying what the Government considers it to be worth.

Against this, it was emphasized, is the present system of state leases which are essentially the same as those on privately owned property. Terms, including the royalty, is fixed; virtually all areas are open with offers on a competitive-bid basis; the operator is free to operate the property as he sees fit, subject only to the established policies of the state regulatory agencies.

The point also was made that these considerations of the best method for developing oil in the so-called tidelands are apart from the legal, moral, and historical rights of the state for ownership of their offshore areas. If the federal Government is successful in taking over all offshore lands, it is felt this would represent a major weakening of administration at the local level.

Lease Status Questioned

Texas last November leased some 600,000 acres, most of it in the Gulf of Mexico. The sale brought $12,295,359 to the permanent Texas school fund. There is a difference of opinion on what the status of these leases would be if the quitclaim bill fails to pass and the Government wins an ownership suit against Texas.

Soon after the Supreme Court's June decision in the California case, several major companies conducting work in the Gulf of Mexico suspended operations because of the question raised as to ownership. Several months later, however, work was generally resumed since the operators apparently felt Congress would act to confirm their state leases. The belief was expressed last week that even though the quitclaim fails to pass, other legislation would certainly provide some degree of protection for those who had taken leases from the state in good faith. Exchange of state for federal leases is provided for California operators under terms of the Interior Department's proposed federal leasing bill.

Ickes Says He and F.D.R. Started Tidelands Suit

WASHINGTON. — Inspiration for the Government's effort to settle the question of tidelands title came from the late President Roosevelt, former Secretary of the Interior Harold L. Ickes disclosed March 8.

Ickes said he had held the opinion that the states had title but began to change his mind when the President brought it up in April, 1937, and a year later he asked the Department of Justice to bring suit against California; that he opposed the earlier test suit against one California operator and got President Truman to force Attorney General Clark to bring a new suit against the state.

The question now is not states' rights but the desire of certain oil companies to get oil from the states because that is easier, and if the Government had lower royalties the companies would favor federal control, Ickes said.

Krug Opposes Tidelands-Return Bill Before Senate-House Group

WASHINGTON. — Legislation restoring the tidelands to the states was pictured last week by Secretary of the Interior J. A. Krug as a threat to government dominion over the continental shelf, proclaimed as part of the United States by President Truman in 1945.

Testifying before the joint Senate-House judiciary group which has been holding hearings on the legislation since February 23, Krug based his argument on the claim of Texas to all of the continental shelf facing its shores in the Gulf of Mexico, asserted by the state legislature last May, an action which he predicted will be followed by similar declarations by other coastal states.

Krug told the committee that the continental shelf off the United States and Alaska comprises 759,200 sq. miles with an estimated content of 100 billion barrels of oil, or one-tenth of the oil resources attributed to all the continental shelves of the world, and may be considered perhaps the most valuable of all our natural resources.

Opposes "Gift"

"The oil reserves in the continental shelves contiguous to the coasts of the United States are vital to the economy and defense of the United States as a whole," he declared. "The people of the United States cannot afford to make a gift of these tremendously valuable resources to a few coastal states."

Krug attempted to "sell" the committee on the merits of the administration's so-called "management" bill, now pending before the Senate interior and insular affairs committee, formerly the public lands committee. Later, he told reporters that applications for leases are being filed with the department, but no action can be taken on them since there is no law.

This is a matter apparently of some concern, since the secretary added that the department is attempting to determine what it can do in case of an emergency, even without legislation, to produce oil from the submerged lands.

Heretofore, Krug said, the question of whether the states or the federal Government had the right to the oil in the continental shelf has been regarded as a legal question, and the legislation "apparently" represents the "first outright assertion that the people of the United States ought to give away rights in the immensely valuable resources of the continental shelves beneath the open sea."

He predicted — inferentially before the committee but definitely to reporters later—that if the legislation is passed President Truman will veto it.

Like Attorney General Tom Clark, who preceded him, Krug contended the Government did not intend to interfere with properties on ocean fronts or reclaimed land, but Irving M. Smith, city attorney of Long Beach, Calif., charged that a supplemental decree asked of the Supreme Court by the Department of Justice would so define the inland and open-ocean waters in San Pedro Bay as to bring the marginal sea inside of a breakwater constructed by the Government.

In anticipation that the Government's claims of ownership would be broad, Smith said, applications for leases filed with the Interior Department cover the entire water front of the city, covering all of its harbor facilities, recreation and park improvements. Many of these applications were filed by speculators and promoters who sold stock in their proposed ventures.

Smith said an "outstanding example" of location were two applications filed by Robert E. Lee Jordan, who sought unsuccessfully to intervene in the Supreme Court in the Government case. One of these applications covers a large area including portions of the federal breakwater, he said, and the other covers extensive harbor improvements.

FPC Worried

Smith challenged an assertion by Clark that oil did not enter into the submerged-lands picture until the early twenties, declaring that oil has been produced from tide and submerged lands off the California coast for more than 50 years, the first development being in 1894.

Joining with other government agencies in opposing the legislation, the Federal Power Commission has expressed the fear that, as written, it would deprive the Government of its authority to undertake power and other projects in state waters. An attempt apparently has been made to enlist various valley development associations in a campaign to press this point of view, which Walter Johnson, chairman of the tidelands committee of the National Association of Attorneys General, said was unfounded.

However, Johnson said, the proponents of the legislation are willing to spell out the continuance of the Government's rights in this respect by an amendment that nothing in the act shall limit the powers of Congress to control the navigable waters within the states for the purposes of navigation, flood control, and the production and distribution of electric power.

Coastal States Scored As Alarmists by Clark

WASHINGTON. — The announcement that the federal Government will soon bring suits against Texas and Louisiana to gain control of their off-shore oil lands was made by Attorney General Tom C. Clark last week during testimony designed to convince Congress that no coastal state ever did have any claim to its tidelands.

Drawing a distinction between the legal status of the marginal sea and inland waters, Clark endorsed the Barkley bill waiving all federal claims to inland waters and charged costal states with raising a false issue to scare inland states into supporting their legislation. Besides offering all states their inland waters, Clark told the joint congressional committee he would not seek injunction relief but would "forgive" both oil operators and states for operations prior to the date of the Supreme Court decision.

Quitclaim Is "Gift"

Legislation surrendering federal claims to off-shore lands would be a "gift," Clark declared, saying: "We now know that California, for example, does not have and never did have any title to the lands underlying the ocean seaward of low-water mark; and that the United States, rather than the coastal states, is vested with the right and power to control the disposal of the resources situated in those lands. There is no state title or interest which can be subject to the so-called 'cloud' which a quitclaim would remove. Consequently, the proposed legislation would operate as an outright gift of the rights and interests of the United States in the subsoil of the adjacent oceans. And the beneficiaries of this gift would not be all the states of the Union but only those states which by accident happen to be those coastal states off the shore of which valuable and essential mineral deposits are located."

Clark challenged the right of Congress to undo the Supreme Court decision by vesting tidelands title in the states and violation of the constitutional principle of tri-partite government and separation of powers, saying, "Congress may decide a question of policy; it cannot decide a question of law."

Changes Required in Synthetics Bill to Win Industry Support

by Bertram F. Linz

WASHINGTON. — Representatives of the oil industry last week displayed a tendency to go along with the Government in the development of synthetic-fuels production, but while they were united in demanding that Governmental participation be limited to scientific cooperation and financial assistance they were divided on the point of whether the time was ripe for the construction of commercial plants.

They expressed their views before the House Interstate Commerce Committee during hearings on the Wolverton bill to authorize the administration program for construction of three commercial plants on government money, for operation by private industry. The bill authorizes an appropriation of $400,000,000.

In addition to a general discussion of the proposal, the committee was told of the work now going on in the production of gasoline from natural gas by P. C. Keith, president of Hydrocarbon Research, Inc., and in production from coal by Joseph H. Pursglove, Jr., president of Pittsburgh Consolidation Coal Co.

Definite views on the program as a whole, offered by A. C. Rubel, vice president of Union Oil Co. of California; Eugene Ayres, staff chemist for Gulf Research & Development Co., and E. C. Murphree of Standard Oil Development Co., and testimony of Harvey J. Gunderson of the board of directors of the Reconstruction Finance Corp., showed that the bill, if it is to accomplish its objective, must be revised in several respects before it goes to the floor of the House.

More Time Needed

All industry witnesses were agreed that the 120 days provided for the submission of definite proposals for construction of plants by the industry was far from adequate, and it was agreed that at least a year would be required for the engineering necessary to develop such proposals.

While some witnesses felt that the bill was ill-timed, Rubel came up with a definite proposal for starting a synthetic industry, although he made it clear he was committing neither himself nor his firm.

Pointing out that the Pacific Coast will be the first area to experience a lack of supply of natural crude—he estimated that the production and demand curves would meet in 1950 or 1951—Rubel said a shale-oil production plant should be constructed in Colorado, with such financial assistance from the Government as might be necessary, suggesting the initial capacity should be in the neighborhood of 25,000 bbl. daily. This oil then should be transported by rail to California for refining and consumption there, and since the cost of production and transportation would make the oil more costly than crude the Government should stand the difference until the industry was well started.

Could Add Pipe Line

Once production was under way, Rubel said, it could be increased as rapidly as necessary and, once it reached 100,000 bbl. daily, a pipe line could be built, reducing the transportation cost.

Rubel expressed the belief that industry would do this on its own in the normal course of events and emphasized his plan was offered merely to meet the urgency with which the Government appeared to view the situation and, he said, if the Government felt it necessary to accelerate the development of synthetics it should be prepared to pay the extra costs. If the project was successful, he said, industry eventually would take over and carry on by itself.

"If it doesn't prove feasible," he told the committee, "at least it will be demonstrated to what extent it is feasible and if it is considered desirable as a national defense project it can be carried on."

The idea, he explained, is similar to the "educational" orders placed by the military services to acquaint manufacturers with their specialized needs.

Ayres opposed the bill on the ground that the taking of the steel required would tend to make the oil supply worse instead of better during the next few years and construction of commercial plants could have an adverse effect upon long-term development of synthetic fuel.

The Bureau of Mines, he said, has used considerable money, manpower and time building the pilot plant at Louisiana, Mo., for the hydrogenation of coal, all of which will be wasted if a commercial plant is attempted before the pilot has been brought into operation.

With respect to coal gasification, no one knows how to design a satisfactory plant; two pilot plants are about to be built and until they have been tried out commercial construction should not be attempted. The first commercial plants for Fischer-Tropsch conversion of natural gas will be operating in a year or two, but the same technology should not be designed into coal conversion plants until some operating data have been accumulated. In the case of shale, he said, the bureau is not satisfied with the retorting processes so far used, and commercial production should not be attempted until a better process has been developed.

Better results would be assured, he concluded, if the start of a commercial industry is deferred for 3 years or so.

Murphree gave general approval to the bill, but suggested that only one coal plant be built, since if two are constructed and one process is found superior to the other, there will be considerable waste of money.

The biggest set-back to the plan, however, came from Gunderson, who explained the RFC authority to make loans is limited to assistance for projects that can be expected to show a profit from which the advances can be repaid.

Gunderson pointed out that in April 1946 it made an advance to Carthage Hydrocol for construction of a plant at Brownsville, Tex., to produce around 7,000 bbl. daily from natural gas, and has recently been requested to make loans for two similar plants with a daily production between 7,000 and 10,000 bbl. each.

Moral Support Only

"Appreciating the need of these products, the RFC is taking a sympathetic and helpful attitude," he said. But, he added, the agency no longer has its wartime authority to give financial encouragement to projects that may not pay out and has no power to subsidize any commercial operation.

Consequently, he told the committee, if the RFC is to participate in the synthetic-fuels program it will be necessary to enact legislation giving it new authority.

"The industry would be able to go quite far if it had the same tax benefits enjoyed by oil companies in the field of drilling for petroleum," Gunderson suggested.

To each of the industry witnesses, the committee gave a list of questions to be answered in writing for inclusion in the record.

The answers to the 24 questions propounded will develop the industry view as to the need of additional liquid energy resources and, if there is need, whether the Bureau of Mines work has progressed to the point where commercial plants are warranted, whether there are alternatives to the construction of such plants, whether the diversion of the steel necessary for their construction is considered warranted, and the financial aspects of construction and operation.

this week

TIDELANDS—Interior Secretary Krug describes tidelands-return bill as threat to federal dominion over Continental Shelf. . . . Pushes administration's bill to provide management of California offshore lands. . . . ¶Attorney General Clark decries "gift" of offshore lands provided in bill. . . . Questions right of Congress to "decide a question of law" in acting contrary to Supreme Court opinion. . . . ¶Texans undisturbed by news Texas will be target of next suit. . . . Speculation widespread over effect of possible veto of pending bill. . . .

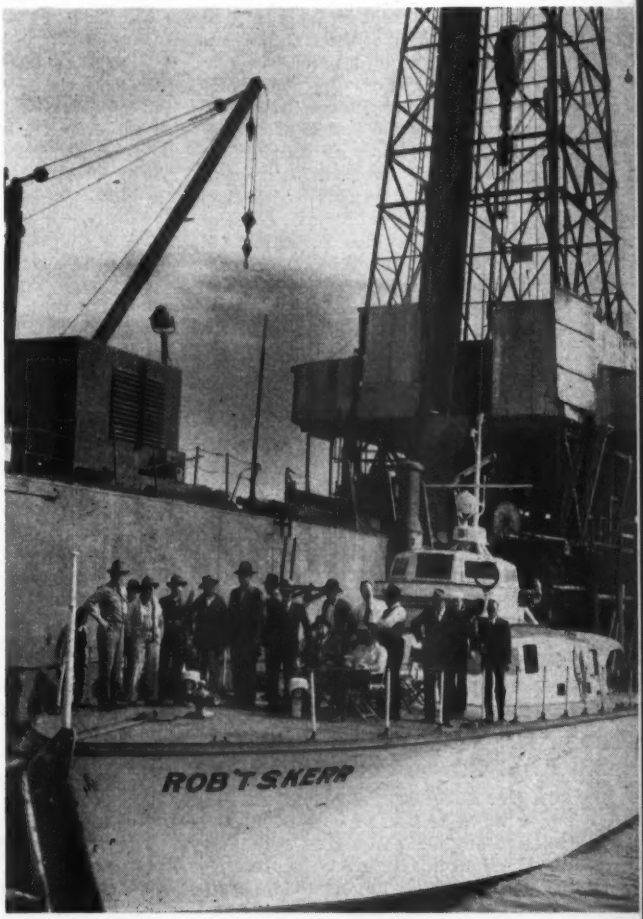
SYNTHETICS—Stanolind Oil & Gas Co. announces $80,000,000 hydrocarbon-synthesis plant will be built east of Garden City, Kans. . . . Work to begin as soon as site selected following soil tests. . . . Materials for plant already being fabricated. . . . ¶Oil industry leaders united in demanding that Government participation in proposed synthetics industry be limited to scientific cooperation and financial assistance. . . . RFC official says agency cannot make loan to finance plants. . . . Oil representatives ask changes in Wolverton bill. . . .

REFINING—American Gas Association announces new processes for producing utility fuel gas by catalytic cracking of light hydrocarbons. . . . First large-scale unit for this process being built by Long Island Lighting Co. at Riverhead, L. I. . . . ¶Lion Oil Co. buys Ozark Ordnance Works at El Dorado, Ark., from WAA for $10,500,000. . . . Plant will help meet demand for fertilizer in the Mississippi Valley. . . . ¶Topping plant of about 1,000 bbl. daily will be constructed at Bishop, Tex., by H. R. Smith and W. C. McBride, Alice, Tex. . . .

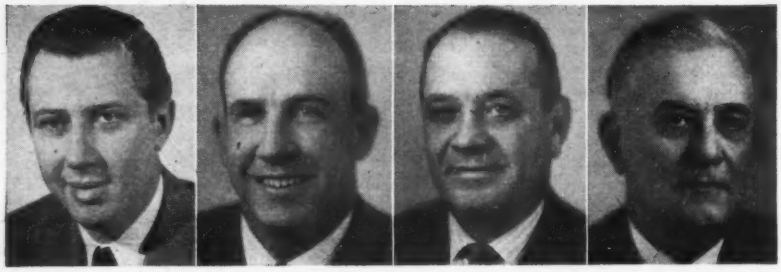
PIPE LINE—FPC grants Tennessee Gas Transmission Co. temporary authority to build 150 miles of loop lines and additional compressor capacity costing about $12,000,000. . . . Work on looping scheduled to start soon. . . . ¶Texas Pipe Line Co. prepares construction program of 949 miles of pipe for several projects. . . . ¶Shell Pipe Line Corp. makes preliminary study of Wink, Tex.-Wilmington, Calif., 900-mile, 20-in. crude-oil line. . . .

TRENDS—Kerosine production reaches new record high with total output during week ended February 28 of 2,780,000 bbl. . . . Figure well above previous record of 2,561,000 set during week ended January 31 and weekly average of 2,289,000 bbl. during December. . . . ¶Kerosine stocks, while continuing downward trend, drop only 137,000 bbl. during week and remain unchanged in East Coast "shortage" area. . . . ¶Gasoline stocks continue to climb. . . . Stocks now about 7,500,000 above total of a year ago. . . . ¶Runs to stills average 5,463,000 bbl. daily during week ended February 28, continuing high level of operations. . . . Figure well above daily average runs of 4,820,000 bbl. of February 1947. . . .

INTERNATIONAL—Venezuelan reserves will not be opened for the United States nor other Western Hemisphere countries for continental defense, official says. . . . New official policy to be one of "not contemplating the granting of new concessions." . . . ¶Colombian oil strikers return to work after 45 days of idleness. . . . ¶Overseas Consultants, Inc., recommend no Japanese refining or storage facilities be designated for reparations. . . . ¶Socony-Vacuum and Royal Dutch-Shell companies complete negotiations to pay higher price for Venezuelan royalty oil. . . . Price believed to be between 19 and 24 cents. . . .



Kerr-McGee Oil Industries, Inc., et al., have found an oil and gas show at 7,595-7,607 ft. in the Block 28 well, shown here, indicating the possibility of their second Gulf of Mexico discovery well in 4 months. Sidewall coring revealed gas in the top and oil saturation in the basal portion of the 12-ft. section. Kermac on November 17 brought in a 900-bbl. producer on Block 32, 11 miles off Terrebonne Parish, Louisiana, and 8 miles west of the test pictured here. Stanolind Oil & Gas Co. and Phillips Petroleum Co. are partners with Kermac in the development of 40,000 acres of offshore leases. Included in the group pictured here are Kenneth B. Barnes and Leigh S. McCaslin, representatives of The Oil and Gas Journal, who visited the operation last week. A detailed engineering article on the operation will appear in the March 18 Oil and Gas Journal



Shown here are officers of the North Texas Oil and Gas Association, all of them from Wichita Falls. Left to right are George Dimock, of Akin & Dimock, president; R. Clay Underwood, independent producer, first vice president; Adam Seitz, of Seitz, Comegys & Seitz, second vice president; and Fred Sehmann, former secretary-treasurer of Petroleum Producers Co., executive vice president

North Texas Association Told Needs of Secondary Recovery

by George Weber

WICHITA FALLS. — Increased recovery factors for the nation's proven oil reserves were declared a matter of immediate urgency last week at the third annual secondary recovery session held in Wichita Falls under the auspices of the North Texas Oil and Gas Association.

Wider application of presently proved methods for water flood and gas repressuring was cited as important but insufficient in itself. Secondary recovery research, to be conducted on a vast cooperative scale, was urged as a paramount necessity if the oil industry is to continue to meet future demand with its present system of private enterprise.

The North Texas meeting this year comprised two concurrent sessions. George W. Dimock, independent operator of Wichita Falls, presided over the general session which concerned the problems of management, taxation, cost estimation, contract drilling, the wage-hour law, public relations, and industrial accidents.

The public's demand that the oil industry expand twice as fast as normal is causing a whole series of problems and ramifications, the association was told by B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc. Jennings, who spoke at the annual banquet, discussed the general economic situation in the petroleum industry. A summary of his talk appears on the opposite page.

New Report Released

In the secondary recovery session, under the direction of consulting petroleum engineers Jo H. Cable and W. H. Rouzer, engineers representing practically all important areas of settled production in this country reviewed progress to date and considered future means for recovering more oil from older fields.

As a basis for the study of past operations, a Report of Investigations (R.I. 4250) by the U. S. Bureau of Mines entitled "Secondary Recovery of Oil by Water-Flooding in Fields of North Texas" was released at the opening session. R. K. Guthrie, coauthor with J. W. Amyx and D. B. Talliaferro, summarized its content. Water flooding in North Texas, begun in 1936, has expanded greatly since the early war years to include 70 projects at the present time. The trend has been to deeper fields. Most producing sands water flooded have been relatively thin, nearly half the reservoirs averaging less than 10 ft. in thickness and almost all less than 20 ft. of sand thickness.

Projects range in size from 15 acres to nearly 2,000 acres, and problems encountered, methods employed, and degrees of success varied widely with the result that little generalization concerning water-flooding in North Texas was possible. A significant point was made regarding the production of oil credited to water flooding, relative to total production in the district. Water-flooded production during 1947 amounted to nearly 400,000 bbl., but represented only 1 per cent of total oil produced in that district. This comparison, made in a minor producing district of Texas which has seen the greatest degree of secondary recovery, hints at the role that secondary recovery must play there and elsewhere in future years.

The past reviewed, engineers and operators turned to the important consideration of future secondary-recovery work. A progress report on "The Significance of Connate Water, Capillary Pressure, and Relative Permeability in Secondary Recovery" was given by Dr. George H. Fancher of the University of Texas who is directing the studies of Leroy Puls, Stanley Reynolds and other students in that research project. This report drew attention to the broadening base of reservoir study, to include investigations of the physical characteristics of formations and fluids as a means to improved estimation of reserves in place, and better understanding of their behavior as affected by pore size and shape, wettability and surface tension.

An optimistic note was sounded by R. M. Wagstaff, Abilene attorney, concerning one of the most serious current deterrents to greater secondary-recovery work; the questionable legal position of unit operation of oil properties. He based his contention that unitization for secondary recovery was on firm legal ground on the fact that Texas' conservation statute, enacted later than the state's antitrust law, either set aside or placed limitations on the antitrust law. He gave his considered opinion that unitization of oil properties for the primary purpose of recovering oil which would remain underground without unit operation, was legal, and further that operators under the state's conservation law were under obligation to produce their properties according to the best approved engineering methods to prevent waste, both on the surface and underground.

Antitrust Threat Minimized

Legislation relieving unit participants of the threat of antitrust prosecution was declared as having a good chance of passage by the Texas legislature at its next session. As regards federal antitrust statutes, which in these times of encroaching federal control might be construed as applicable to such oil operations, he held that unit operation for the primary purpose of conservation was legally sound and that future decisions made in the light of conservation's vital importance would verify his views.

A forceful reminder of the responsibility borne by the State of Texas and its oil industry was made by Railroad Commissioner William J. Murray, Jr. Outlining the greatly expanded demand for petroleum products and the awakening interest of the general public in oil's national importance, he called for greater cooperation between the state and the industry, and among companies and operators themselves. He stumped vigorously for a vast secondary-recovery research program and for rapid widespread dissemination of findings so that Texas' unrecovered oil in older pools might be produced as rapidly and efficiently as possible. He reported on the $40,000 program of research in this subject now being begun in the state's two leading petro-

leum engineering schools; only a small beginning of the proposed program the state hopes to sponsor.

The value of freer exchange of information regarding secondary recovery work was well illustrated in the paper entitled "Economic Aspects of Water Flood Projects in North Texas," presented by Walter C. Krog, petroleum engineer. Concerned with the important matter of costs and returns, this survey would have been even more valuable had more operators cooperated in furnishing him with their individual figures. From those projects on which data were available, waterflooding proved profitable, even before the recent increase in crude prices. On the basis of current operations, taking into consideration average increases in cost of equipment and operating expenses, those projects covered showed still greater profits. The limited examples cited, however, should not be taken as representative of operations in general in North Texas, and the author warned against the assumption that all water-flooding projects there were profitable.

Gas repressuring in the district was discussed in a joint paper by Roland Gouldy and Gordon Stine, local petroleum engineers, who reported on several successful examples of that type of secondary recovery.

The secondary recovery session concluded with an open forum during which questions were asked of a panel of 11 engineers and educators.

Increased drilling activity in North Texas during the past year was reflected in the program of the general session. W. K. Powell, of Two States Drilling Co., Dallas, outlined methods for estimating the costs of drilling in that area. J. Ed Warren of Carl B. King Drilling Co., Midland, discussed the relationship of the drilling contractor to the petroleum industry, and the tubular goods problem.

Public Must Be Told More Oil Depends On Industry Earnings, Jennings Says

WICHITA FALLS.—The task facing the oil industry is not only to increase production but also to explain to the public why oil is scarce, why it is difficult to increase supplies rapidly, why it must get more money for its products, and why it must earn more inflation dollars to do the job.

This was the keynote of an address by B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., at the annual banquet of the North Texas Oil and Gas Association here March 6.

Speaking on the general economic situation in the oil industry and the public's misunderstanding of conditions, Jennings said that what consumers inevitably call an oil shortage is due simply to the fact that the demand has far outstripped the industry's capacity to expand.

The oil industry has increased its crude-oil production by 39 per cent since 1945, a record better than any other industry, he said, citing increases of 7 per cent for steel, 18 per cent for coal, 20 per cent for agriculture, and 15 per cent for general manufacturing.

"It is not surprising," said Jennings, "that the industry could not fully prepare itself within the 2 short years since the end of the war for the mass switchover from coal to oil that has taken place in all categories—in industry, on the railroads, in the homes, and on the farms."

Must Avoid Profiteering

Noting that the price of crude oil is now 125 per cent of the 1941 price, the speaker declined to express an opinion as to whether the present price is too high, too low, or just right, but he added:

"When the whole world is calling for more oil, the burden of proof would appear to rest on him who states that prices are too high. On the other hand, if the oil industry values its good name, it cannot permit itself to go to extremes. If it is to avoid the charge of profiteering, it must take care that whatever is done can be defended on sound grounds of industry economics and public interest. Simply to charge what the traffic will bear would be tragic and to my mind likely to result in the end of the oil man's freedom.

"The cost of living has gone up 65 per cent since 1935-1939, a period generally regarded as normal. By comparison, the price of gasoline (excluding tax) is up 39 per cent, and of heating fuel 89 per cent. These increases are due in large part to the increase in the price of crude oil, but, in addition, there have been substantial increases in wages and in the cost of transportation, all of which are important factors in the final prices of petroleum products.

"On the whole, the various units in the industry have done an honest and competent job in reflecting increased cost. Most companies keep careful track of all elements of cost and, in general, their objective is the recovery of these costs, together with a reasonable profit. There have been isolated instances of excessive markups by some dealers or jobbers, but apart from such, I see no evidence of any attempt to capitalize on local conditions of 'shortages.'"

Those who criticize the high earnings of oil companies fail to realize that prices have gone up for everything oil companies must purchase, Jennings said.

"Here are some figures, taken at random, which will show how 'cost of living' has increased in the oil industry:

"The cost of a new service station is three times what it was 10 years ago.

"The oil industry is spending four times as much for exploration work as it did 10 years ago.

"The estimated cost of replacing each barrel of developed crude oil drawn from the ground is up from 48 cents in 1936 to around 75 cents today.

"The estimated cost of drilling wells in the United States is up from around $33,000 (average per well) in 1941 to over $70,000 today.

"Refinery equipment, which cost before the war around $400 a barrel of capacity, now costs over $1,000.

"The matter of corporate earnings, and particularly oil company earnings, deserves a good deal more study and thought than have so far been given to it. Industrial earnings are complicated enough in a period when the general economy is stable. They become infinitely more difficult of analysis when the general economic level is undergoing change and all prices are rising in response to a monetary inflation.

"Consider some of the effects of inflation on corporate earnings as computed and reported according to the long-standing and accepted principles of accounting. Because the purchasing power of a dollar today is not what it used to be, we see that current earnings are not directly comparable with prewar earnings. Today almost everything costs at least half again as much as it did. That is to say that a dollar is worth only two-thirds what it was. Therefore, any fair-minded person might be expected to conclude that if $1,000,000 was a fair or normal profit in 1941, then $1,500,000 would be equally so in 1947. Even this comparatively simple arithmetic has been overlooked by a lot of people, and yet there is an important additional element which must be considered and it is not as easy to understand. That element has to do with depreciation, and perhaps more importantly depletion.

Depreciation a Factor

"We have in any business, whether oil or anything else, a lot of properties acquired in prewar years at costs prevailing in those days. I would estimate that upwards of three-fourths of the proven oil reserves of the United States were discovered and developed before Pearl Harbor. All but an insignificant proportion of the oil pipe lines certainly antedate 1941. Refining is a fairly fast-moving activity because of ad-

(Continued on page 155)

International

WORLD-WIDE OIL DEVELOPMENTS

Activity Points to New Guinea as Important Far East Producing Area

EXPLORATORY and development operations in New Guinea indicate that this area soon may become one of the most important producing areas in the Far East.

Before the Japanese swooped down on the Netherlands East Indies, N.V. Nederlandsche Nieuw Guinee Petroleum Mij. had drilled 14 wells at Klamono, 8 of which were commercial producers.

Exactly what the potential is has not been revealed, but most of the crude oil is reported to be of 45° A.P.I. gravity and some of 19° A.P.I. gravity. During the war these wells were capped.

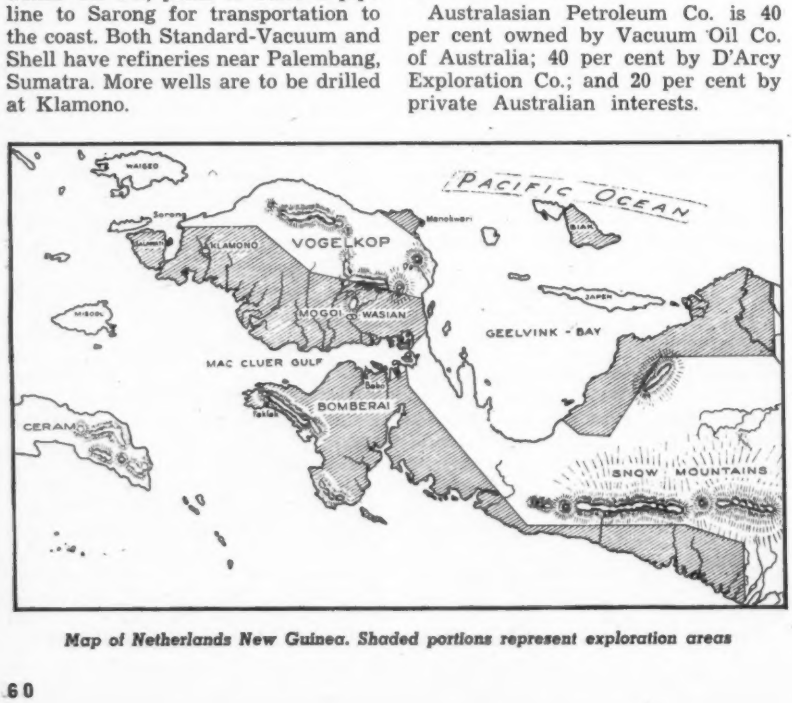
As soon as possible, N.N.G.P., which is 40 per cent owned by Standard-Vacuum Oil Co., 40 per cent by Bataafsche Petroleum Mij. (Royal Dutch Shell), and 20 per cent by California-Texas Oil Co., plans to build a pipe line to Sarong for transportation to the coast. Both Standard-Vacuum and Shell have refineries near Palembang, Sumatra. More wells are to be drilled at Klamono.

At Klamono oil is found in a Miocene limestone at about 200 meters (640 ft.) under a series of marly clays with intercalations of marly limestone of young Miocene age.

Oil at Wasian-Mogoi (see accompanying map) is found in the top of the Miocene limestone. Here, however, the limestone is covered by a series of marly clays of Pliocene age. The depth of the oil horizon at Wasian is about 1,000 meters (3,200 ft.) and at Mogoi at about 400 meters (1,280 ft.).

Australasian Petroleum Co., Pty., Ltd., is carrying on geological and geophysical work in the Mandated Territory of New Guinea. Currently a wildcat, 1 Kariana, is being drilled. The latest information indicates that it is down to around 1,500 ft., with no oil shows to date.

Australasian Petroleum Co. is 40 per cent owned by Vacuum Oil Co. of Australia; 40 per cent by D'Arcy Exploration Co.; and 20 per cent by private Australian interests.



Map of Netherlands New Guinea. Shaded portions represent exploration areas

Little Change Seen in Egyptian Production

EGYPTIAN crude-oil production last year averaged 25,500 bbl. daily, or approximately the same as during 1946, according to official figures just released by Asiatic Petroleum Corp.

The total production for 1947 from Egypt's three principal fields was. Ras Gharib, 8,847,000 bbl.; Hurghada, 351,000 bbl.; and Sudr, 112,000 bbl. Egypt's newest field, Asl, located about 10 miles south of Sudr, where a wildcat was successfully completed early this year, has been shut in, pending construction of a pipe line to the Gulf of Suez. *(The Oil and Gas Journal, February 12, page 60.)*

During 1947, six oil wells were brought in at Ras Gharib and three at Sudr. Footage drilled totaled 15,933 ft. in Ras Gharib; 2,525 ft. at Hurghada; and 21,388 ft. at Sudr. At the end of the year, one well each was being drilled at Ras Gharib and Hunrghada and two at Sudr. As of December 31, there were 24 flowing wells and 59 on the pump at Ras Gharib; 48 wells on pump and none flowing at Hurghada; and 4 flowing wells and 1 on pump at Sudr. Only one well was suspended, that one at Sudr. However, there were 17 wells shut in at Ras Gharib and 1 at Gemsa.

Average daily crude-oil production during December was 29,300 bbl. at Ras Gharib; 1,060 bbl. at Hurghada; 4,900 bbl. at Sudr; and none at Gemsa. The accumulative production from these fields from time of discovery, shown in parentheses, to the end of 1947 was: Ras Gharib (1938) 69,086,000 bbl.; Hurghada (1913) 36,976,000 bbl.; Gemsa (1908) 1,420,000 bbl.; and Sudr (1946) 114,000 bbl. Sudr field was not opened up commercially until December 9, 1947.

Ras Gharib and Hurghada are fields of Anglo-Egyptian Oilfields, Ltd. (Royal Dutch-Shell). Sudr field(as well as recently-discovered Asl) is joint owned by Anglo-Egyptian and Socony-Vacuum Oil Co., Inc.

The Sudr production comes from basal Miocene and Eocene limestone, and approximates 22°-24° A.P.I gravity, with Ras Gharib crude the highest, from 25° to 26°. All these crudes are of a mixed base.

Venezuela's Minister of Fomento Balks at Oil-for-Defense Talk

VENEZUELA has no intention of making its oil reserves available to the United States or other countries of the Western Hemisphere for purposes of continental defense, it was stated last week by Dr. Juan Pablo Perez Alfonso, Minister of Fomento.

The statement was made in comment on press reports from the United States quoting members of Congress as suggesting that pressure be put on oil-producing countries of Latin America to make their petroleum reserves available for continental defense in view of the heavy drain on the reserves of the United States and the difficulty of relying on supplies from the Middle East.

The official position of the Government, Perez Alfonso said, is that Venezuela is not interested in increasing its oil production because it has already reached such a high point that it would be hard to replace the national wealth being extracted with investments of capital to prevent the impoverishment of the country. It is our responsibility to future generations to transform oil resources, which are exported to other countries, into productive investments, he added.

Pointing out that during the past 2 years the former administration granted new oil concessions covering an area almost equal to all concessions in force in 1943, the Minister said:

"For these reasons and others too numerous to mention, the new official policy has been one of not contemplating the granting of new concessions. The government will continue to survey and study the natural resources of Venezuela in order to plan the economic development most advantageous to the general interest. In this respect there is a real possibility of collaboration with other American countries that will allow intensification along this line so that their objectives may be attained more quickly, since a knowledge of the natural resources of the American continent is of interest to all. But it is not reasonable to pretend that these irreplaceable resources of some American countries should be at the unlimited disposal of others."

Thornburg Denies Favoritism Charges

A VEHEMENT denial that he had put oil company interests ahead of national interests while serving as petroleum adviser to the Department of State during the war has been made by Max W. Thornburg in an open letter to Senator Owen Brewster who had made this accusation during a Senate investigation.

Writing from his home in Bahrain, Persian Gulf, where he is a foreign industrial consultant, Thornburg charged Brewster with taking advantage of his senatorial position to attack him when he is out of the country and unable to defend himself by a personal appearance before Brewster's committee.

Thornburg said that in several interviews with Brewster early in the committee's investigation into Navy purchase of Arabian oil he had answered all questions and Brewster had not questioned the integrity of his government service. He asserted that Brewster had "accepted the highly prejudiced views of former Secretary of the Interior Harold L. Ickes who has publicly expressed his antagonism to me."

Answering Brewster's charge that he was "planted" in the State Department to serve the interests of his employers, Standard Oil Co. of California and The Texas Co., Thornburg said the department sought him out and the companies let him go with reluctance. He said everything he did while in the department was with the knowledge and approval of his superiors and that he asked to have career diplomats assigned as his assistants.

Much of the work he did was against the interests of his former companies and other major oil companies, Thornburg wrote, listing the Latin American oil supply pool, negotiations with Venezuela leading to the 1943 petroleum law of that country, opposition to the "Pauley Mexican oil deal which Ickes and his office innocently or otherwise backed," creation of the Petroleum Reserves Corporation, control of oil shipments to Spain which cost The Texas Co. its market there, and creation of a system of petroleum attaches in the United States foreign service. These actions, Thornburg said, caused his relations with his former employers to become so strained that he did not return to them after leaving the department.

International

WORLD-WIDE OIL DEVELOPMENTS

Socony-Vacuum, Shell To Keep Royalty Oil

Socony-Vacuum Oil Co. of Venezuela and the Royal Dutch-Shell companies in Venezuela have completed negotiations with the Venezuelan Government whereby they will pay higher prices for royalty oil.

It is believed that the increased per barrel price which Socony-Vacuum is now paying approximates 24 cents. The increased Shell prices probably range between 19 cents (the average per barrel increase being paid by Creole Petroleum Corp.) and 24 cents.

Combined daily production of Socony-Vacuum and Shell in Venezuela last year approximated 358,800 bbl., with Shell having 330,900 bbl. *(For additional details on the Creole contract, see The Oil and Gas Journal, March 4, page 45).*

Of Shell's daily production of 330,900 bbl., 16⅔ per cent, or about 55,150 bbl., accrues to the government, while the 16⅔ per cent which Socony-Vacuum produces as royalty oil amounts to 4,650 bbl. daily. Virtually all of this royalty oil will now be retained by both companies.

Late last week the Venezuelan Ministry of Development announced that the Government will not accept any additional cash bids for royalty oil from outside sources, as it has in the past.

However, the Government is retaining the right to take certain percentages of the companies' royalty crude oil for barter purposes.

The Venezuelan barter arrangements are negotiated in exchange for certain basic commodities not readily obtainable for dollars.

India Taking Steps to Build Synthetics Industry

Looking forward to creating an Indian industry to manufacture synthetic petroleum products from coal, the Indian Government has set up a committee to work out the details, according to a dispatch from Bombay.

When such an industry comes into being it is expected that there will be a new demand for second and third-grade coal, of which there is an abundant supply in that country.

Indicative of the seriousness in which the program to establish a synthetic plant in India is being planned is the fact that the Ministry of Industry and Supply already has taken initial steps by sending sample indigenous coal supplies to the United States for testing.

Meanwhile, the sales tax on gasoline in India has been doubled.

Use of Secondary-Recovery Methods Boosts Output of Crude Oil in Russia

ON the basis of reports from Russian sources which are believed to be reliable, it appears that the application of secondary-recovery methods in the Soviet Union was responsible for a 13.8 per cent rise in crude-oil production in southern and western Russia and a 25.7 per cent rise in that country's eastern oil regions during 1946.

According to Dr. Hugo Burstin, noted European technologist and chief chemist with Polish oil refineries and research institutes for more than 25 years, several noteworthy secondary-recovery methods have been put into operation in Russia with excellent results. Examples of successful application of secondary-recovery methods include:

1. Increase of pressure in the strata by introduction of air. In 1946 approximately 7,000,000 cu. m. (247,100,000 cu. ft.) of air were pumped into the stratum of the Shirokaya Balka (Krasnodar) oil fields. The stratum pressure rose by 10 to 12 atmospheres (150 to 180 psi.) and two of the wells commenced to produce.

Gas Injection Used

2. In 17 input wells in Bori-Sou (Malgobeknieft) oil field, from 30,000 to 40,000 cu. m. (1,059,000 to 1,412,000 cu. ft.) of gas were injected daily. The total amount of air and gas pumped into the 17 wells since 1945 was 21,500 million cu. m. (759,950 million cu. ft.), with a consequent rise of crude oil production of 50,000 metric tons (about 375,000 bbl). Approximately 400 cu. m. (14,120 cu. ft.) of gas and air were used for each additional ton of oil.

Schodnica oil field in western Ukraine, formerly Polish, which had produced oil for the past 40 years, yielded an additional 50,000 metric tons (375,000 bbl.) after the introduction of this repressuring method. In 1946 alone an estimated 3,500 metric tons (26,250 bbl.) was obtained from Schnodica.

In Krasnokamsk (Molotovnieft) oil field, 2.5 million cu. m. (88,250 million cu. ft.) were injected in 1946, resulting in an additional yield of 5,830 tons (43,725 bbl.) of crude oil. This was the first time in U.S.S.R. that secondary methods were applied in a carbonate stratum.

3. Water flooding. This method found general application in the oil fields of Dossor and Maket in Kazakhstan. There are 42 input wells in that area through which 360,000 cu. m. (12,708,000 cu. ft.) of water were

pumped in 1946. From 98 oil wells, the yield was increased by 4,700 metric tons (25,250 bbl.). Preparations are being made for the application of the flooding method in the Artemnieft oil fields.

4. Application of hydrochloric acid. This method was used in 400 separate cases in 1946, with the result that an additional 90,000 metric tons (67,500 bbl.) were recovered. This method was found particularly satisfactory in the Central-Asiatic oil fields of Kalininnieft and Voroshilovnieft. In the West-Ukranian oil fields hydrochloric acid was, for the first time, used in oil-bearing sandstones.

5. Shooting. The "torpedoing perforation" method, invented by a Russian engineer, with the last name of Kolodyashny, was first used with success in 1946 in the oil areas of Axerbaidjan. The resultant crude-oil increase approximated 300 metric tons (2.250 bbl.) daily.

Deep-Well Pumps Used

Production of oil by means of deep-well pumping has been developed to quite an extent in Russia since the war and has greatly contributed to increased yields. As of the first of January last year, the number of working deep-well pumps in Azerbaidjan was 780; in Kazakhstan, 200; and in the Grozny area, 55.

Among other methods of increasing the yield of oil which found application in the Soviet oil industry was the forced displacement (by pumping out) of oil from water-flooded wells. The oil field of Oktiabrnieft showed an increase of 35,000 metric tons as a result of the application of this method in 1946, and wells in the Azerbaidjan and Kazakhstan arears, to which the method was applied also, showed an increase of 40 to 50 per cent.

A special commission of the Soviet Institute for Oil Prospecting, under the direction of Dr. N. B. Vasoyevitch, Professor N. T. Lindtrop and Prof. B. D. Golubyatnikov, has undertaken an expedition to Dagestan, north of the Caucasus, with a view to extensive geological exploration of that area.

After 12 years of exploratory work in the Lenin District of Azerbaidjan, an oil well is reported to have been brought in there. The well was drilled to 2,700 ft. and has a daily output of 280 bbl. Extensive exploratory work is now being carried on there.

The Aziesbekov Oil Trust is about to start drilling two wells which may be the deepest in the Soviet Union. The site is near the small town of Zirya and it is estimated that the wells will have a depth of from 16,500 to 17,500 ft. Drilling towers of about 180 ft. are planned.

Exploration Continuing

A Far East expedition of the Russian VNGRI Institute has carried out important geological and geophysical work in southern and northern Sakhalin Island and thoroughly investigated the stratigraphy and tectonics of those areas. The occurrence of oil and natural gas is suspected in a number of places on the west coast. In southern Kamchatka, some traces of oil were found for the first time in the Paleocene.

The death last year of N. F. Sedigh, who was 63, is recognized as a great loss to the Soviet oil industry. In Sedigh's last 10 years he contributed greatly to the professional training of Russian petroleum chemists by making translations of American research papers on oil processing and systematic reports on the progress of American oil technology. Sedigh was the author of more than 100 books and larger works and prepared over 1,500 reports on foreign technical publications. He was a graduate of the Petersburgh Electrotechnical Institute and the Mining Academy of Freiburg, Saxony.

Northwest from Stalingrad—the famous turning point of military fortunes on the eastern front in World War II—a prolific gas formation was found on the banks of the Archeda River, a tributary of the Don River. The importance of this discovery is such that the Soviet Government considers it as a forerunner of new oil and gas fields on the southeastern border of the Russian plan.

Russians Return Tankers

Russia last week returned two lend-lease tankers to the United States, delivering them to Yokohama. The ships were to be taken by American crews to the Persian Gulf to load oil for delivery to the East Coast. The first lend-lease ship was returned to Hong Kong the previous week. Five others remain to be returned.

Retention by Japan Of Oil Facilities Urged

WASHINGTON.—Retention by Japan of her 9,807,550-bbl. petroleum-refining and her 7,293,000-bbl. petroleum-storage facilities has been recommended to Secretary of the Army Kenneth C. Royall by Overseas Consultants, Inc., engaged by the Army Department to survey Japan's industrial potential, the requirements for economic recovery and stabilization, and the availability of industrial assets for reparations removals.

None of the Japanese refining or storage facilities should be designated for reparations, the report held.

However, the Secretary was informed, Japan has 900 metric tons capacity of synthetic-rubber facilities which it is not believed can be effectively utilized in that country and which should be made available for reparations.

The report indicated a belief on the part of the assessors that the cost of removing plants for reparations would be more than the value of the equipment thus transferred, and it was suggested that, with the exception of primary war facilities, the removal of productive facilities which can be effectively used in the country would hurt world production and reduce the likelihood of Japan becoming self-supporting.

Motor-Fuel Shortage in Monterrey Area Reported

HOUSTON. — A shortage of motor fuel in the Monterrey, Mexico, area was reported last week by tourists returning from trips below the border.

In McAllen, Texas, one tourist said there were long lines waiting at filling stations for gasoline and that it was impossible to get gasoline except through hotel garages. Despite the shortage, however, prices were unchanged at about 30 cents a gallon, according to the reports.

Creole January Output Again Sets New Record

Pushing its daily crude-oil production in Venezuela to an even higher figure, Creole Petroleum Corp. in January recorded an output of 617,019 bbl., compared with the heretofore all-time high of 616,838 bbl. reached in December.

Of the daily average January production, 460,746 bbl. came from the Lake Maracaibo area, 150,952 bbl. from eastern Venezuela, and 5,321 bbl. from Cumarebo.

Creole's Venezuelan refinery runs averaged 64,132 bbl. daily, of which 55,884 bbl. were refined at Caripito and 8,248 bbl. at La Salina.

Twenty-three development wells and four wildcats were brought in as oil producers. Creole had two dry holes, one at Temblador and the other in the Jusepin area. Fields where the wells were brought in, their average initial production, and average depth follow:

Development: Bolivar Coastal (B. C. F.), 16 wells, 619 bbl., 3,730 ft.; Quiriquire 4, 536 bbl., 4,035 ft.; Mulata 2, 437 bbl., 5,589 ft.; and Temblador 1, 380 bbl., 4,052 ft.

Exploratory: Bolivar Coastal (B. C. F.) 1, 750 bbl., 5,391 ft.; Jusepin area 1, waiting test, 5,534 ft.; Mulata 1, waiting test, 6,720 ft.; and Tucupita 1, 516 bbl., 5,710 ft. The Tucupita well (TC-3) was drilled by Texas Petroleum Co.

Colombian Oil Strikers Ordered Back to Work

Pending the settlement of oil labor disputes in Colombia, the Colombian Government has ordered the strikers to resume work, after 45 days of idleness.

Strikers were ordered to resume work immediately as the labor law forbids work stoppages while differences are being arbitrated. A board of arbitration is provided by the law, with one member each appointed by the government, the strikers, and the company. Should any party refuse to select an arbiter, the government would appoint one. *(For more information about this strike, see The Oil and Gas Journal, February 12, page 61.)*

Commercial Oil Well Completed in Turkey

Oil has been found in commercial quantities in Turkey according to press reports from Istanbul. The reports state that a new oil field has been discovered near Diyarbakir located in the Tigris valley of southeastern Turkey. This is the first successful completion as a result of the government's extensive postwar program to find oil in that country. The wildcat test was drilled by Drilling & Exploration Co. of Dallas and Los Angeles which has a contract with the Turkish Government covering the drilling of several tests.

The reported location indicates that the well is not far from the northern boundary of Iraq where Petroleum Concessions, Ltd., a subsidiary of Iraq Petroleum Co., Ltd., has a development program under way in its Ain Zalah field. Drilling was recently resumed in this field which was discovered before the war.

Other fields in that immediate area are not being produced owing to the low gravity and high sulfur content of the crude oil. Kirkuk field of the Iraq company which has been producing approximately 90,000 bbl. of crude oil daily since 1934 when pipe lines were completed to Haifa, Palestine, and Tripoli, Lebanon, is about 200 miles south of Iraq-Turkish border.

International
WORLD-WIDE OIL DEVELOPMENTS

Secondary Recovery to Be Discussed in Meeting

Secondary recovery will hold the spotlight at the Mid-Continent district meeting of the American Petroleum Institute, to be held in Wichita, Kans.

Care and maintenance of oil-field equipment will be covered in six technical papers. Four technical papers will be presented on the second day of the meeting on production practices.

Registration and committee meetings will be conducted on the opening day of the meeting. Following is the program for the second and third days.

THURSDAY, MARCH 25

General Session, 10 a.m.

Addresses by C. S. Ritchie, mayor of Wichita; Frank Carlson, governor of Kansas; and Jake L. Hamon, Cox & Hamon, Dallas, vice president of production; "The Significance of Hydrocarbon Synthesis in Western Kansas," A. L. Solliday, executive vice president, Stanolind Oil & Gas Co.

Secondary-Recovery Session, 1:30 p.m.

"Performance of Water-Flooding Projects in Greenwood County, Kansas," N. E. Maxwell, Cities Service Oil Co., Bartlesville, Okla.; "Typical Projects and Problems in Secondary-Recovery Operations," D. B. Taliaferro, U. S. Bureau of Mines, Bartlesville; "Statutes Relating to Secondary-Recovery Operations," R. E. Hardwicke, attorney, Fort Worth, Tex., and Walter L. Summers, University of Illinois, Urbana, Ill.; and "Magnitude of Water-Flood Production in Kansas," A. E. Sweeney, Interstate Oil Compact Commission, Oklahoma City.

FRIDAY, MARCH 26

Equipment Care and Maintenance Session, 9:30 a.m.

"Classification of Plastic Coatings," J. L. Robertson, Phillips Petroleum Co., Bartlesville, Okla.; "A Recommended Field Practice on Care and Use of Tubular Goods," H. M. Cooley, Bethlehem Steel Co., Tulsa; "Installing Expendable Anodes," W. E. Huddleston, Huddleston Engineering Co., Bartlesville, Okla.; "Practical Results of a Planned Oil-Well Corrosion-Prevention Program in Western Kansas," Walter C. Pearson, Stanolind Oil & Gas Co., Ellinwood, Kans.; and "Blast Cutting of Iron," Prof. W. L. Gilliland, Purdue University, Lafayette, Ind.

Production Practices Session, 1:30 p.m.

"Desirable Characteristics of Pumping Units and Engines," J. C. Slonneger, Continental Supply Co., Dallas; "Calculation of Peak Crankshaft Torque from Dynamometer Cards," Harold S. Kelly, M. H. Halderson, P. A. Witherspoon, and E. S. Calvert, Phillips Petroleum Co., Bartlesville; "Your Tool Pusher or Production Foreman Is as Close as Your Telephone and Vice Versa," Robert S. Johnson, Southwestern Bell Telephone Co., Kansas City; and "An Apprentice Engineer Training Program," Harold S. Kelly, Phillips Petroleum Co., Bartlesville.

Proven Reserves Show Gain in 1947

by Charles J. Deegan

PROVEN reserves of crude oil, natural-gas liquids, and natural gas as of January 1, 1948, were greater than those on the same date a year earlier, in spite of record production, according to the joint report of the reserves committee of the American Petroleum Institute and the American Gas Association. The net increase, as shown in Table 1, is 715 million barrels of liquid hydrocarbons and 5.35 trillion cubic feet of natural gas.

TABLE 1—U. S. PROVEN RESERVES
(Millions of barrels—Trillions of cubic feet)

Crude oil, January 1, 1948	21,488
Crude oil, January 1, 1947	20,874
Increase	614
Natural gas liquids, January 1, 1948	3,254
Natural gas liquids, January 1, 1947	3,163
Increase	91
Total liquids increase	715
Natural gas, January 1, 1948	165.93
Natural gas, January 1, 1947	160.58
Increase	5.35

Tables 2, 3, and 4 show the detailed breakdown by states for total liquid hydrocarbons, crude oil, and natural gas. Details on natural-gas liquids only, can be obtained by subtracting the figures in Table 3 from the corresponding totals in Table 2.

Five states—Louisiana, Texas, Wyoming, Colorado, and Oklahoma—accounted for the bulk of the crude-oil reserve increase, 497,153,000 bbl. out of the 614,125,000 bbl. total. New Mexico, New York, and Ohio were the only states to show decreases.

Four states—Texas, Louisiana, California, and Oklahoma—accounted for nearly 89 per cent of the total natural-gas-liquids reserves of slightly over 3¼ billion barrels. Of these, Oklahoma showed an increase of almost 87 million barrels and Louisiana slightly over 43 million; Texas showed a decrease of about 28½ million barrels; Illinois and Wyoming had a combined decrease of almost 32 million barrels, due largely to revisions of previous estimates.

Five states—Texas, Louisiana, Kansas, Oklahoma, and California, in that order—account for the bulk of the natural-gas reserves. All showed fair increases over last year except California, which decreased almost 9 per cent.

The "fuel oil equivalent" of the natural gas reserves is approximately 33 billion barrels. (F.O.E. equals 6 million B.t.u., or 5,000 cu. ft. at 1,200 B.t.u. per foot.)

TABLE 2—ESTIMATED PROVED RESERVES OF LIQUID HYDROCARBONS IN THE UNITED STATES
(Thousands of barrels)

	Proved reserves as of Dec. 31, 1946 (1)	Extensions and revisions (2)	New pools discovered (3)	Production during 1947 (4)	Proved reserves as of 12-31-47 (Cols. 1+2+3 less Col. 4) (5)	Change in reserves during 1947 (Col. 5 less Col. 1) (6)
Alabama	512	2,652	.....	405	2,759	2,247
Arkansas	328,658	56,221	2,055	31,767	355,167	26,509
California	3,601,763	349,645	13,787	358,081	3,607,114	5,351
Colorado	302,247	103,089	160	15,672	389,824	87,577
Illinois	385,464	50,151	8,892	71,226	373,281	—12,183
Indiana	44,155	7,502	1,580	7,157	46,080	1,925
Kansas	627,808	110,034	19,290	105,642	651,490	23,682
Kentucky	75,259	12,900	2,770	11,035	79,894	4,635
Louisiana	2,071,193	293,132	66,814	177,321	2,253,818	182,625
Michigan	69,832	8,602	8,946	16,601	70,779	947
Mississippi	323,454	72,554	1,820	35,492	362,336	38,882
Montana	112,780	9,758	2,665	9,181	116,022	3,242
Nebraska	875	205	.....	214	866	—9
New Mexico	617,062	40,611	3,453	44,721	616,405	—657
New York	76,289	.....	.....	4,770	71,519	—4,770
Ohio	30,934	3,581	.....	3,785	30,730	—204
Oklahoma	966,503	198,443	100,254	157,207	1,107,993	141,490
Pennsylvania	99,810	38,178	.....	13,032	124,956	25,146
Texas	13,631,966	737,673	261,450	896,489	13,734,600	102,634
West Virginia	54,940	4,813	.....	6,140	53,613	—1,327
Wyoming	614,816	108,491	10,795	44,891	689,211	74,395
Miscellaneous	459	3,142	.....	398	3,203	2,744
Total U. S.	24,036,779	2,211,377	504,731	2,011,227	24,741,660	704,881

TABLE 3—ESTIMATED PROVED RESERVES OF CRUDE OIL IN THE UNITED STATES
(Thousands of barrels)

	Proved reserves as of Dec. 31, 1946 (1)	Extensions and revisions (2)	New pools discovered (3)	Production during 1947 (4)	Proved reserves as of 12-31-47 (Cols. 1+2+3 less Col. 4) (5)	Change in reserves during 1947 (Col. 5 less Col. 1) (6)
Alabama	512	2,652	.....	405	2,759	2,247
Arkansas	267,058	56,485	1,287	27,922	296,908	29,850
California	3,293,491	321,281	13,355	333,164	3,294,963	1,472
Colorado	299,870	97,524	160	15,672	381,882	82,012
Illinois	351,264	62,464	8,853	67,220	355,361	4,097
Indiana	44,070	7,507	1,580	7,142	46,015	1,945
Kansas	545,316	102,248	19,131	104,017	562,678	17,362
Kentucky	59,188	12,189	2,770	9,597	64,550	5,362
Louisiana	1,651,797	238,940	57,547	157,280	1,791,004	139,207
Michigan	69,177	8,136	8,762	16,361	69,714	537
Mississippi	270,221	68,334	24	34,902	303,677	33,456
Montana	104,246	16,796	2,665	9,045	114,662	10,416
Nebraska	875	205	.....	214	866	—9
New Mexico	543,453	24,546	3,395	40,911	530,483	—12,970
New York	76,289	.....	.....	4,770	71,519	—4,770
Ohio	29,220	3,392	.....	3,618	28,994	—226
Oklahoma	898,186	114,457	82,302	141,955	952,990	54,804
Pennsylvania	97,501	37,936	.....	12,717	122,720	25,219
Texas	11,646,360	714,105	232,804	815,732	11,777,537	131,177
West Virginia	35,655	3,100	.....	2,663	36,092	437
Wyoming	589,358	123,913	10,795	44,755	679,311	89,953
Miscellaneous	453	2,930	.....	383	3,000	2,547
Total U. S.	20,873,560	2,019,140	445,430	1,850,445	21,487,685	614,125

TABLE 4—ESTIMATED PROVED RECOVERABLE RESERVES OF NATURAL GAS IN THE UNITED STATES
(Millions of cubic feet)

	Reserves of December 31, 1946	Changes in reserves during 1947: Extensions and revisions	Discoveries of new fields and new pools in old fields	Net production*	Total
Alabama	97	503	.....	76	524
Arkansas	871,662	50,926	29,940	62,379	890,149
California	11,126,301	—460,302	58,251	559,894	10,164,356
Colorado	315,763	11,906	15,238	11,041	331,866
Illinois	268,000	—5,832	7,770	48,807	221,131
Indiana	17,000	—1,000	.....	3,000	13,000
Kansas	13,680,844	1,090,607	24,877	239,412	14,556,916
Kentucky	1,386,000	88,480	.....	95,000	1,379,480
Louisiana	22,411,511	1,164,711	590,878	685,867	23,481,233
Michigan	131,000	38,008	36,881	37,420	168,469
Mississippi	2,370,513	65,536	71,877	55,166	2,452,760
Missouri	55	.....	.....	1	54
Montana	853,401	—165,947	49,255	36,199	700,510
Nebraska	1	809	.....	160	650
New Mexico	5,904,786	6,293	311,365	232,161	5,990,283
New York	69,900	1,000	.....	6,000	64,000
Ohio	614,000	71,200	.....	74,000	611,200
Oklahoma	10,735,845	272,040	967,265	624,286	11,350,864
Pennsylvania	503,000	56,063	.....	76,000	483,063
Texas	86,363,459	4,960,772	1,205,496	2,504,161	90,025,566
West Virginia	1,840,000	163,735	.....	223,000	1,780,735
Wyoming	1,035,597	164,536	41,077	49,422	1,191,788
Miscellaneous	77,166	—3,390	.....	6,359	67,417
Total	160,575,901	7,570,654	3,410,170	5,629,811	165,926,914

*Net production equals gross withdrawals less gas reinjected into underground reservoirs.

Commerce Department Rates Oil Industry Second in Need for Steel

WASHINGTON. — The Department of Commerce last week rated the oil industry the second most important of the "four strategic areas" for which steel is to be allocated under the voluntary agreement now being drawn up by the steel industry.

First on the list was freight car production and repair of railway rolling stock; petroleum, gas and oil equipment came next, and agricultural equipment was third and housing materials fourth.

Upon receipt of the requirements figures now being prepared by the NPC committee under Russell B. Brown, general counsel of the Independent Petroleum Association, Commerce will submit to the steel advisory committee such program as it believes should receive consideration for the purpose of the agreement.

Accompanying the program will be supporting data showing the number of manufacturers represented; specific products covered, with the steel required by product, tons, and end-use; a comparison of the proposed program with the production program, by product, of the steel-consuming industry for 1936-39, inclusive, and the current production program; reasons why an increase, if any, above present commitments by the steel industry is essential to the carrying out of the proposed program, and evidence that the proposed program meets the requirements of the Taft antiinflation act.

The procedure then will be as follows: If the advisory committee recommends that the steel industry participate in the proposed program, it will be forwarded to the director of the iron and steel division of the Office of Industry Cooperation for review with the steel products advisory committee, composed of representatives of the steel producers, as to the available supplies of the various items of steel products needed. Subject to the conclusions reached upon review, the program then will go to the "task force," composed of representatives of the producers, which shall submit recommendations to the secretary of commerce as to equitable allocation of tonnage, by products, among steel producers.

"Any such voluntary agreement shall include provision to the effect that steel-consuming interests to which steel is made available under the agreement shall undertake that such steel shall not be used by them for any purpose other than that specified in such agreement," the department said.

McHugh Reported Planning to Resign

JOSEPH L. McHUGH, Louisiana conservation commissioner and principal oil and gas regulatory official in the state since 1940, is reported to be preparing to resign.

McHugh's resignation would result from the recent election of Earl Long who will take office May 11 as Louisiana's new governor. Although McHugh was generally regarded as neutral during the gubernatorial campaign, he is believed to be out of sympathy with the incoming Long administration.

There is considerable speculation that Sam Caldwell, secretary of the Arkansas - Louisiana division of the Mid-Continent Oil and Gas Association, will be named to succeed McHugh.

Caldwell was mayor of Shreveport prior to his appointment with the association about a year ago. His present headquarters are in Shreveport. Prior to becoming mayor of Shreveport, he was an independent operator working in the East Texas area during the early 1930's.

Caldwell's appointment presumably would be welcome to the industry. The post pays $6,000 a year. McHugh owns an automobile agency at Jennings, La., where he lives, and at one time was head of an independent oil company. He was appointed to the office by Gov. Sam Jones in 1940 and was retained in the office by Gov. Jimmie Davis in 1944.

Texaco Production Heads Open Houston Meeting

HOUSTON.—The annual meeting of top officials of the producing department of The Texas Co. opened here this week.

The meeting of the producing department's producing committee, normally held in New York, was to continue throughout the week. In addition to the committee sessions, the officials were to inspect the newly enlarged Texaco research laboratory at Bellaire, near Houston, and part of the group were to visit company operations in the territory, particularly coastal Louisiana.

In attendance from New York were R. Ogarrio, vice president in charge of the producing department and chairman of the committee; R. F. Baker, general manager of the department and committee vice chairman; F. C. Sealey, general manager of Texaco's foreign producing department; and W. J. Hanley, secretary.

Other producing department executives attending were: E. R. Filley, manager; A. R. Wilson, assistant manager; J. N. Troxell, assistant manager-departmental geologist; W. V. Vietti, assistant to the manager and manager of the gas division; V. L. Porter, assistant to the manager; L. A. Scholl, Jr., manager, geophysical division; E. P. Hayes, chief petroleum engineer; and J. C. Brooks, department agent, all of Houston. Division managers taking part in the meeting were: W. C. Kneale, Houston, South Texas division; C. B. Williams, Fort Worth, West Texas division; R. L. Keyes, New Orleans, Louisiana division; H. A. Stewart, Denver, Rocky Mountain division; M. J. Heald, Tulsa, Oklahoma division; and J. T. Wood, Jr., Los Angeles, Pacific Coast division.

Atlantic Refining, Sun Oil Seek Development Permit

HOUSTON.—Atlantic Refining Co., Dallas, has filed application with the Army Engineers office in Galveston requesting a blanket Department of the Army permit authorizing all work necessary to oil development in State Tract 71, Copano Bay, about 5½ miles north of Rockport, Aransas County, Texas.

Another application was filed with the Army Engineers office by Sun Oil Co., Beaumont. Sun asked permission to lay a 2½-in. gas pipe line in Galveston and East bays from a point in State Tract 232 to shore at Smith Point, Chambers County, Texas.

Texas' Governor Will Address Illinois Group

Gov. Beauford H. Jester of Texas, chairman of the Interstate Oil Compact Commission, will deliver the principal address at the third annual meeting of the Illinois Oil and Gas Association in Mount Vernon, Ill., March 22.

Approximately 750 members of the oil industry from seven surrounding states are expected to hear Governor Jester's address on "Private Industry Under State Regulation — America's Best Plan for Oil Development."

Gov. Dwight H. Green of Illinois will introduce Governor Jester.

Suspension of Proration Laws Asked by Wherry to Meet Demand

WASHINGTON.—The simplest remedy yet suggested for the oil shortage was sounded out last week by Sen. Kenneth S. Wherry of Nebraska, chairman of the Senate small business committee: Use the Connally "Hot Oil" Act to suspend the state proration laws until sufficient crude to meet demand is produced.

Furthermore, Wherry told President Truman in a letter, such action is mandatory.

Wherry charged flatly that the major companies have used the proration laws to strengthen their hold on the industry.

"The committee," he wrote the President, "is of the opinion that the shortage of petroleum has been used by the large integrated oil companies to expand their own direct operations to the detriment of the independent distributors; that it has been used by them to bring about unreasonably high prices for petroleum products, and that there has been manipulation of crude-oil production and transportation facilities to bring about these results."

Connally Act Quoted

He pointed out that the Connally Act provides that "whenever the President finds that the amount of petroleum and petroleum products moving in interstate commerce is so limited as to be the cause, in whole or in part, of a lack of parity between supply (including imports and reasonable withdrawals from storage) and consumptive demand (including exports and reasonable additions to storage) resulting from an undue burden on or restriction of interstate commerce in petroleum and petroleum products, he shall by proclamation declare such finding, and thereupon the provisions of 715b shall be inoperative until such time as the President shall find and by proclamation declare that the conditions which gave rise to the suspension of the operation of the provisions of such section no longer exist." Section 715b is the ban on shipments of "hot" oil.

"May I inquire whether you or any of the administrative offices under you have made any study to determine officially under the above act whether there is a 'lack of parity between supply and consumptive demand?' " Wherry asked. "Whether the statements made by Interior Department representatives as to present and prospective shortages of petroleum were made with a view to action under the above referred to Section 4 of the Interstate Transportation of Petroleum Products Act or represented studies in other connections has not been made clear.

"It would seem difficult to conclude otherwise than that there is a lack of parity between supply and consumptive demand for petroleum and that the law in such event is mandatory upon you to issue a proclamation which would thus result in the law becoming inoperative."

Wherry did not disclose whether his suggestion was based on investigations which showed that the compact states were not producing at MER, nor did he offer any opinion as to whether the wells could be opened wide without danger to the underlying reserves.

Drop Seen in Needs Of Military Forces

WASHINGTON.—The Armed Services will require 117,040,000 bbl. of petroleum products during the fiscal year beginning July 1, 4,712,000 bbl. less than the requirements for the current fiscal year, it was estimated last week by the Armed Services Petroleum Board.

An analysis of the estimates by the NPC committee on military and government petroleum requirements shows that aviation-gasoline requirements other than jet fuel, will be 8 per cent over the current year, while Navy special fuel oil will be 7.8 per cent less.

The ASPB estimates call for 20,260,000 bbl. of aviation gasoline, against 18,719,000 bbl. for the current year; 2,537,000 jet fuel against 1,644,000; 16,340,000 motor gasoline against 14,094,000; 1,621,000 kerosine against 1,223,000; 20,466,000 Navy diesel against 18,147,000; 10,337,000 other diesel against 2,148,000; 34,489,000 Navy special against 42,297,000, and 11,000,000 other heavy fuel against 109,752,000. The figures are not strictly comparable, however, because the Bureau of Federal Supply this year purchased 12,000,000 bbl. of products for the armed services.

"The anticipated reduction in armed services requirements at a time when domestic civilian requirements are still increasing rapidly will no doubt be welcomed by the industry," it was commented by Howard W. Page, acting chairman of the committee, in a report to the committee.

"If it is assumed that armed service purchases from foreign supply areas continue at approximately present levels, the domestic armed service purchases will not exceed 4 per cent of the total United States demand," he said.

Land Bureau Issues Option Report Warning

WASHINGTON.—The Bureau of Land Management this week reminded companies and individuals who hold options on leases or applications for leases on federal lands for geophysical purposes that they must file a detailed report on such options, if held December 31, last, by March 30.

The bureau called attention to the new requirement this year for reports on options involving lands acquired by the federal Government as well as those on the public domain, under a law enacted last August 7 transferring jurisdiction over mineral development on acquired lands to the Interior Department.

The 1946 revision of the Mineral Leasing Law set up the present system of obtaining options on federal land for scientific oil exploration, providing for nonrenewable 2-year options on not to exceed 100,000 acres in any one state at any one time.

The reports required this month must show identifying details of each option, the number of acres covered by each, and the aggregate number of options held in each state and their total acreage. If reports disclose that options in excess of 100,000 acres are held by any optionee in one state, the holder will be given 30 days in which to file proof his options have been reduced to the limitations prescribed by the law.

First Oklahoma Well To Be Given to City

Oklahoma's first commercial oil well will be given to the City of Bartlesville March 12.

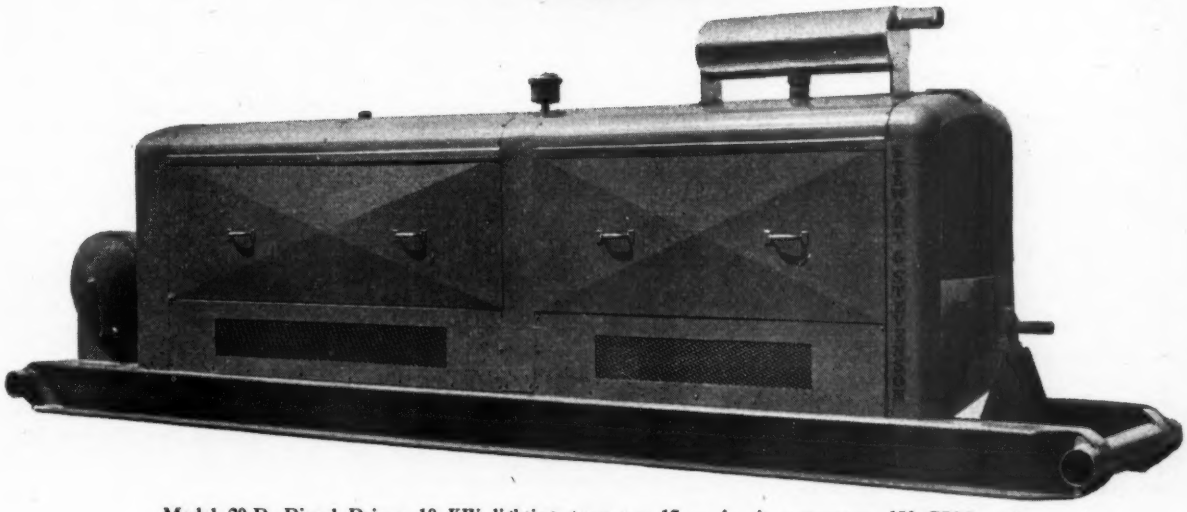
Howard Cowden, president of Co-Operative Refinery Association, Kansas City, will present the deed to the well to Mayor R. H. Hudson. The city plans to develop the site as a state historical monument.

Panhandle Producing Buys Wil-Tex Oil Corp.

Panhandle Producing & Refining Co. has contracted to purchase all outstanding stock of Wil-Tex Oil Corp. for about $4,000,000, according to John Boyce, president of Panhandle.

Producing properties of Wil-Tex are located in East White Point, Refugio, and West Ranch fields in South Texas. In the last quarter of 1947 production averaged about 1,450 bbl. of oil and 4,700,000 cu. ft. of gas daily.

NEW, IMPROVED 1948 MODELS
STEWART & STEVENSON AUXILIARY UNITS



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WASHINGTON WATCHING

BY BERTRAM F. LINZ

Double Trouble

WASHINGTON.—Industry plans for a voluntary agreement under the Taft antiinflation law may find it difficult to surmount two hurdles which are being raised by the administration, both serious.

One of these, of course, is the "clearance" which will be given by the Department of Justice to assure the industry that in years to come it won't be prosecuted for violations of the antitrust laws based on actions which the Government now asks it to take.

The other is the supervision which the administration may insist on and which would permit the Government to "call the shots" to be made by the industry.

Remembering the historic "Madison case," many members of the industry will participate in a formal agreement only if the Department of Justice assures them, unequivocally, against antitrust prosecutions, and a few probably wouldn't go along even then. Just what form of statement the department should make in this connection does not appear to have been worked out, but it may be asked to list specifically the several activities which will be provided for in the agreement.

Potentially as important in determining the efficacy of any agreement will be the extent the Government will insist on "supervising" its development. The Interior Department is believed to be in favor of giving the industry a free hand, but the department alone is not making the regulations and other agencies are understood to demand that the Government direct the whole operation.

Observers believe the Government will have to come up with definite formulas for eliminating both these handicaps within the next two or three weeks if anything like industry-wide cooperation is to be secured voluntarily.

Oil Draws a House

THERE are opera lovers, baseball fans, and people who haunt broadcasting studios, and congressional oil hearings appear to be joining the list of entertainments which have their own particular followings.

Washington representatives of the industry associations follow the hearings as a part of their regular routine, as do the correspondents of the industry papers, press association men and an occasional reporter looking for a local angle.

But back in that section of hearing rooms open to the public it is usually possible to spot from one to a half-dozen men from the Armed Services Petroleum Board. The Navy has a couple of very personable Waves who diligently make notes on all hearings for the Library of Congress information service, and a gentleman from the British Embassy, pleasantly bored, follows the testimony with amiable impersonality.

If there is even a hint that a hearing may have a bearing on international matters, a State Department man is pretty sure to turn up, and when the Commerce Department had a chief for its petroleum section he was in pretty constant attendance. Given a hint that a hearing may be a "probe," the Department of Justice perks up its ears, and if there is any suggestion of "monopoly," the congressional small business committees' staffs are on the spot.

In the first days of a long oil hearing, the committee room will be pretty full of visitors looking for a sensation, but they quickly lose interest and in the last days the committee will be acting for the benefit of the faithful followers—the people who cannot get away.

No Santa, He

ATTORNEY General Tom C. Clark gave the joint Senate-House tidelands committee a fine exhibition of dodging and hair-splitting last week as he defended the Supreme Court decision and argued for passage of the so-called "management" bill and its companion quit-claiming federal rights to lands under interior waters.

For their part, members of the group with the exception of Sen. Forrest C. Donnell of Missouri, practically threw everything but the furniture at Clark.

Complaining of Clark's evasive tactics, Sen. Pat McCarran of Nevada told him at one point "I want to tie you down to where you will answer a question directly," and Clark's habit of interrupting senators as they propounded questions drew from Chairman Ed Moore of Oklahoma a gentle suggestion that he would appreciate being permitted to finish a statement.

Clark said to return the lands to California would be a donation, but contended that giving the state 37½ per cent of the royalties with another 52½ per cent going to the 17 reclamation states was not in the same category.

At times, under questioning by Rep. Ed Gossett of Texas Clark and the Congressman shouted at each other.

It took a lot of questioning to get Clark to agree to McCarran's statement that the primary reason for institution of the California suit was oil, and when the Nevada senator asked him to "advise" the committee by citing some decision or legal treatise supporting the court's position, Clark suggested merely that he read the Government brief and the decision itself.

McCarran told the attorney general the original quit-claim bill was passed by both Houses by a big majority "and this Congress will pass it even more emphatically."

Clark refused to "play Santa Claus" when Moore, referring to the fact that officials of 46 states were urging the legislation, suggested it would be "a magnanimous act" for the attorney general to recommend the measure.

Clark's strongest defender was Donnell. Almost every time another member criticised the attorney general, the Missouri senator demanded that the record show that "one member of this committee" agreed with him wholeheartedly.

Speaking of Monopoly

MEMBERS of the House interstate commerce committee are becoming restive under the arbitrary one-man control of Chairman Charles A. Wolverton of New Jersey, and some of its members may soon rebel as they did—though unsuccessfully—last year.

Wolverton has been scheduling hearings for morning and afternoon, practically every day in the week, without regard for what might be going on on the House floor. With no allowance made for emergencies, the committee has been running into difficulties, some last week being a good example.

Because of the slowness with which hearings on export controls progressed, a number of Office of International Trade officials were kept hanging around the committee room for two days and then, before they could be questioned, a scheduled hearing on Wolverton's bill for construction of three synthetic-fuel plants came up.

That hearing was scheduled to begin at 2 p.m., March 4, at which hour the author of the bill was boarding a train for New Jersey and the House was considering an appropriation bill in which, apparently, most of the committee members were interested since the only one to show up was Congressman Lindley Beckworth of Texas who, being a minority

(Democratic) member, could not take over the hearing.

With no Republican member available to preside, the hearing was called off after an half-hour's delay and witnesses were instructed to return the following morning if they desired still to be heard.

Several members of the committee have sought unsuccessfully to have Wolverton set up subcommittees to deal with specific subjects, which would permit several hearings simultaneously and lighten the load. Wolverton, however, has insisted on keeping everything in his own hands and having all hearings before the full committee.

Since the interstate commerce committee has one of the heaviest work loads in the House, members have complained they are overworked and have to deal with too many different subjects at the same time. The committee's authority extends over not only petroleum and natural gas, but railroads, aviation, radio, and a lot of other things, including dental research and experiments in controlling rainfall.

Trade Treaty Doubts

PRESIDENT Truman last week set the stage for another battle with Congress, this one over extension of the Reciprocal Trade Agreements Act for another 3 years.

The law, under which the oil import taxes have twice been chopped, was originally enacted in 1934 as part of the Roosevelt program to combat depression. It has since been extended four times by Congresses dominated by the Democrats, but this time the Republicans say it will be a different story.

The President suggested that the law be extended without change, but the Republican leadership, which in the past fought consistently for modifications which would give Congress some voice in the making of the agreements, long ago indicated its determination to make changes in the act if it is to be extended at all.

It is doubtful, however, that the President is greatly disturbed over the prospects of a disagreement with Congress on the question of foreign trade. He already has a number of other and far more serious fights scheduled over such questions as taxes, civil rights, social security, government reorganization and appropriations, tidelands, and Natural Gas Act revisions.

Obstacles Ahead

CHAIRMAN Charles A. Wolverton may get his bill for government construction of three synthetic fuels plants through his interstate commerce committee, but the measure is likely to run into opposition on the floor of the House.

Most of the members from the oil-producing states agree with the industry's contentions that synthetics development will come from within the industry as rapidly as economic conditions require, and even some members from the consuming states are skeptical of the Forrestal-Krug proposal.

Some members of the powerful House appropriations committee, too, are expected to take the position that since the Government is investing $60,000,000 in the Bureau of Mines' synthetics-research program it might be well to await the results of that study before sinking another $400,000,000 in plants where it might be necessary to duplicate, on a large scale, some of the bureau's work to develop the most economical and efficient methods of production.

One of the most important questions which must be decided before the Government gets into synthetics production was raised recently by E. V. Murphree, president of Standard Development Co., before the House armed services subcommittee. That question, Murphree said, is the policy to be followed with respect to operation of the plants once the 2,000,000 bbl. daily objective has been reached.

If 2,000,000 bbl. daily are produced in peacetime and put into the civilian market, Murphree pointed out, it will be impossible to cut off that supply entirely in the event of an emergency. On the other hand, if the plants are dedicated solely to war use, they must be kept idle in time of peace beyond, possibly, the provision of supplies for normal military and Government use.

That question, it is probable, will be one of many raised if and when the Wolverton bill reaches the House floor.

Standard (N.J.) Orders Two More Super Tankers

With two more 228,000-bbl. tankers, which Standard Oil Co. (N.J.) last week announced it has ordered, the company will have six of these super tank ships by the latter part of 1949. Newport News Shipbuilding & Dry Dock Co. will build the two additional tankers.

Two of this type tanker, ordered earlier, also are being constructed by the Newport News company and the other two by Sun Shipbuilding & Dry Dock Co. One is scheduled for delivery by the end of this year and the other three early in 1949.

Each of the six vessels will have a capacity about 70 per cent greater than the T-2 type tankers constructed during the war. The total capacity of all ships will aggregate 1,368,000 bbl. Combined costs will approximate $31,500,000, according to M. G. Gamble, general manager of Jersey Standard's marine operations.

(For additional information on this type of tanker and its probable use, see The Oil and Gas Journal, February 19, page 71).

Standard Will Import Middle East Crude

NEW YORK.—Standard Oil Co. (N. J.) will receive its first shipments of Middle East crude oil around April 1. These shipments probably will average 15,000 bbl. daily for the remainder of this year.

First cargoes will be loaded at Ras Tanura, Saudi Arabia, as part of Jersey Standard's pro rata share from Arabian American Oil Co. During the latter half of this year it is expected that Jersey will also be purchasing crude oil from Anglo-Iranian Oil Co., Ltd. However, this will not constitute deliveries in connection with the previously announced 20-year crude purchase agreement with Anglo-Iranian, as the latter deal will not be effective until completion of the Big Inch pipe line from Iran and Kuwait, sometime in 1952.

Jersey Standard's Bayway refinery is slated to process the first cargoes. Later it is possible that some Middle East crude will be processed at the company's refineries at Everett, Mass., and Baltimore, Md.

While the first shipments are being made in chartered tankers, Jersey Standard anticipates the use of some of its own tank ships, as well as charter tankers, in other movements this year. First shipments are slated to leave Ras Tanura March 15, 18, and 27, with initial cargoes of approximately 125,000 bbl. each.

March Allowables For Arkansas, New Mexico Set

The March allowable production for Arkansas has been set by the Arkansas Oil and Gas Commission at 93,867 bbl. daily. It will be divided as follows: Controlled oil pools, 70,680 bbl.; controlled gas pools, 6,187 bbl.; and unprorated pools, 17,000 bbl.

Allowable production for New Mexico during March has been set at 135,000 bbl. daily, unchanged from the previous month.

Blodget Named to NPC

Appointment of Rush M. Blodget, executive vice president of the Oil Producers Agency of California, Los Angeles, as a member of the National Petroleum Council, and reapointment of Richard Fenton, executive vice president of the California Stripper Well Association, Los Angeles, was announced last week by Secretary of the Interior J. A. Krug.

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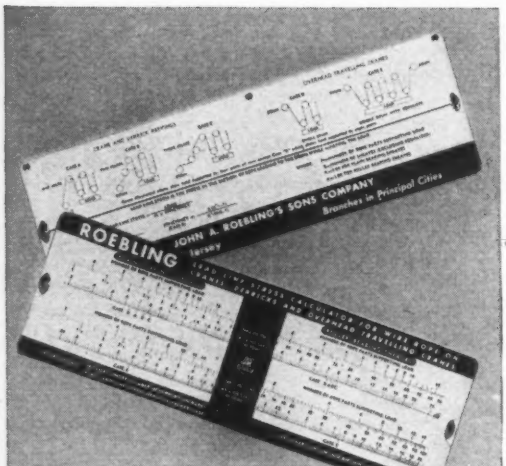

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PERSONALS

Veteran Oil Man Again Is Active in Industry

HARRY LEYENDECKER, formerly assistant vice president of the City National Bank of Houston, last week became vice president of Eastern States Petroleum Co. in Houston.

Leyendecker, whose election to the vice presidency was announced by R. B. Kahle, Eastern States president, will have charge of crude-oil supplies, production, and transportation for the company.

Leyendecker has had a broad career in the oil business, dating back to the mid-1920's when he joined the old Marland Oil Co. in Fort Worth. He was transferred to Ponca City, Okla., and in 1927 joined Tide Water Associated Oil Co. in Fort Worth.

He served Tide Water in several departments during his 15 years with the company. He was moved to Houston in 1933. About a year after the war began, Leyendecker joined the District 3 organization of the Petroleum Administration for War. At that time he was chief scout for Tide Water. With PAW, he served as district director of supply and transportation with headquarters in Houston.

His association with the City National Bank began in April 1945. He originally was in the bank's oil and gas department, later working in the bank's new business section.

Eastern States operates a refinery on the Houston Ship Channel with a rated crude capacity of 30,000 bbl. daily.

Joe Kornfeld, formerly with The Texas Co. at Fort Worth in the geological and engineering departments, has joined Sohio Petroleum Co. as reservoir engineer at Oklahoma City.

S. E. Elder, former district geologist for Sun Oil Co. at Evansville, Ind., has been transferred to Wichita, Kans., to open a district office for the company.

Dr. Harold T. Byck, who has been associated with Shell Development Co. for the past 12 years, has joined the exploration and production research division of Shell Oil Co., Inc., at the Houston laboratory.

Max B. Ederington, superintendent of the Montana-Wyoming division of Interstate Oil Pipe Line Co., has resigned to become superintendent of Andian National Corp., Ltd., in Colombia.

Robert K. Guthrie, formerly petroleum engineer with the U. S. Bureau of Mines, Dallas, resigned March 1 to become the field chairman of the Seeligson Engineering Committee. He will be located temporarily in San Antonio and later will open offices in Alice, Tex.

George D. Fiser, who has been associated with United Gas Corp. and affiliated companies since 1927, has been named general counsel of the United Gas organization. Fiser joined the legal staff of the United companies in 1937. He moved to Shreveport from Houston in 1940.

Chandler Ide, formerly special assistant to PAW Deputy Administrator **Ralph K. Davies** and prior to that assistant to the senior vice president of Standard Oil Co. of California, has been elected secretary and assistant treasurer of American Independent Oil Co. After the liquidation of PAW, Ide served as a special consultant in the Interior Department, where he helped get the Oil and Gas Division started.

R. C. Appling, formerly superintendent of dispatching, telephone, and telegraph of United Gas Corp. at Shreveport, has been promoted to assistant district manager of the Houston district of United Gas Pipe Line Co. and Union Producing Co., United Gas subsidiaries. Appling joined United Gas in 1927 as a dispatcher and in 1940 was made superintendent of dispatching, telephone, and telegraph. **H. W. Johnson,** Houston district engineer for United Gas since 1940, has been named assistant right-of-way department head and transferred to Shreveport.

E. W. Rumsey, formerly with the geological department of Shell Oil Co., Inc., has been placed in charge of the geological department of Zephyr Drilling Co., Tulsa, at Oklahoma City. **Russell Yost,** formerly with Glenn H. McCarthy, Inc., and Houston Oil Field Material Co., Houston, has been appointed drilling superintendent for Oklahoma for Zephyr. He will be stationed at Pauls Valley, Okla.

Albert V. Collins, assistant chief chemist for Shell Chemical Corp., Houston, has resigned to become associated with McGean Chemical Co., Cleveland, Ohio.

R. A. Burdett, assistant chief research chemist for Shell Oil Co., Inc., Wood River, Ill., has been elected chairman of the St. Louis section of the American Chemical Society, succeeding **Milton L. Herzog** of the Western Cartridge Co., East Alton, Ill.

L. A. BOYD

L. A. Boyd, chief engineer for Warren Petroleum Corp., Tulsa, has resigned to join the newly formed Texas Natural Gasoline Corp., an affiliate of Edwin B. Cox & Jake L. Hamon, Dallas, as chief engineer and general superintendent of plants. **John T. Oxley,** formerly secretary and assistant treasurer of Warren, recently was named president of the new organization. Prior to joining Warren in 1940 Boyd was general superintendent of operations for Gas & Oil Products, Ltd., Calgary. He was with Signal Oil & Gas Co. from 1926 to 1934 and was Texas district superintendent at the time he became associated with Gas & Oil Products, Ltd.

E. L. Birmingham, manager of geology and exploration of Bay Petroleum Corp., Denver, has resigned to join **W. N. Bartlett** to form the Birmingham-Bartlett Drilling Co. with offices at Wichita.

Hillyer Brown, a San Francisco attorney, has been appointed a vice president and director of Standard Oil Co. of California. Other changes in company personnel include **Paul L. Fahrney,** general manager of operations in the company's marketing department, appointed vice president; and **Marshall Madison,** member of a San Francisco law firm, appointed general counsel for the company. Re-

PERSONALS

tiring as vice presidents and directors are **J. L. Hanna,** formerly general manager of all refinery operations and director of activities of Standard Tanker Fleet, and **J. MacGaregill,** formerly general manager of the marketing department.

B. B. Bradish, Skelly Oil Co. geologist, has been transferred from Wichita, Kans., to Albuquerque, N. M.

William C. Taylor, who has been acting director of the foreign department of Sun Oil Co., has been appointed director of that department. Taylor, who is now en route to Europe to visit a number of Sun's foreign offices, joined the company in 1933 at the Marcus Hook refinery in the development division. In 1946 he was named assistant manager of the foreign department.

Robert Cannon, engineer for Creole Petroleum Corp. in Venezuela is in New York on a short business trip.

H. D. Borne, acting assistant secretary and treasurer of Texas Pipe Line Co., Tulsa, has been appointed to that position.

L. J. Fulton, formerly chief geologist of the Rocky Mountain producing division for Pure Oil Co. at Billings, Mont., has been appointed assistant division manager in charge of exploration for that area. Fulton, a graduate of the University of Oklahoma in 1928, joined the geological staff of Pure in 1930. He was forferly associated with **Clyde M. Becker,** an independent oil operator. **K. Stewart Cronin** has been named to succeed Fulton as chief geologist of the Rocky Mountain producing division. Cronin, a graduate of the University of Texas in 1931, joined the geological staff of Pure in 1933 at Houston. **Robert A. Fellows,** of the geological staff in the division offices at Billings, Mont., has been named division development geologist. Fellows, a graduate of Beloit College in 1936, joined the geological staff of Pure Oil Co. in 1937.

L. W. Storm and **Simeon B. Christy,** both formerly in the production department of Sun Oil Co. at Dallas, have been appointed to head the new offices which the company has established in Denver. Storm has been named in charge of the geological office and Christy in charge of the land office.

D. P. Olcott, Humble Oil & Refining Co., Houston, has been named to the subcommittee on natural gas of the Military Petroleum Advisory Committee.

R. S. Christie, Amerada Petroleum Corp., has been elected president of the Petroleum Engineers Club of Fort Worth. Other officers elected were: **Gus Athanas,** Stanolind Oil & Gas Co., first vice president; **L. B. Bass,** General Electric Co., executive vice president; **Paschal Martin,** Pure Oil Co., secretary-treasurer; and **M. J. Bridges,** Wheatley Pump Manufacturing Co., second vice president.

William C. Ludt, branch manager of the gasoline-testing laboratory in Tulsa for Ethyl Corp., has been transferred to North Kansas City as branch manager of the laboratory there. **Charles A. Rankin,** branch manager of the gasoline-testing laboratory in San Bernardino, Calif., will succeed Ludt at Tulsa.

Roy L. Cochran, formerly superintendent of Arkansas Fuel Oil Co.'s Columbia natural-gasoline plant in South Arkansas, resigned March 3 to become assistant superintendent of Sun Oil Co.'s new gasoline plant at Delhi, La. **Jim Cole,** formerly with Sabine Valley Gasoline Co., is superintendent of the new plant, which is expected to go on stream late in April.

R. F. Hinchey, Lubbock, Tex., has been named president and general manager of West Texas Gas Co., succeeding **R. E. Wertz,** of Amarillo, who relinquished the post to become chairman of the board of Amarillo Oil Co., an administrative affiliate. Hinchey held the position of vice president and general manager of the company for the past 20 years.

Charles E. Wilson, division superintendent of West Texas area for Stanolind Pipe Line Co., has been promoted to area superintendent of West Texas and New Mexico area, with headquarters in Brownfield, Tex. Other promotions within the company include: **G. L. Miller,** district foreman, Fort Worth, to area master mechanic of East and Central Texas, with headquarters at Fort Worth; **O. C. Watson,** assistant master mechanic, Tulsa, to area master mechanic of the Missouri and Illinois area, with headquarters at Carrollton, Mo.; **C. E. Schuyler,** division machinist for southern Oklahoma, to area master mechanic of the Oklahoma area, with headquarters at Shawnee, Okla.; **J. P. Bradley,** division gager, Fort Worth, to district foreman of Bowie district, with headquarters at Bowie, Tex.; and **Irvin M. Barnett,** chief station engineer, Carrollton, Mo., to district foreman of the Humboldt district, with headquarters at Humboldt, Kans.

E. Russell Lloyd, Midland, Tex., consulting geologist, left for Venezuela where he will spend from 4 to 6 weeks doing special work for Creole Petroleum Corp.

J. M. Fillman, production engineer, Tulsa area, for Shell Oil Co., Inc., has been named to the regional staff, Houston. Other promotions and transfers within the company include: **W. B. Golush,** senior engineer, gas-gasoline, regional staff, to department manager, gas-gasoline, Houston area; **H. M. Goodman,** senior geologist, Midland, Tex., area to regional staff, Houston; **S. Johnston,** geologist, Midland area to regional staff, Houston; **E. H. Leeman,** production engineer, Tulsa area to regional staff, Houston; **S. B. Shaeffer,** geologist, Midland area to regional staff, Houston; **J. S. Baker,** geologist, Midland area to regional staff, Houston; **W. M. Cogen,** geologist, Houston to San Antonio; **R. R. Eckart,** junior production engineer, Houston to Quitman; **J. M. Fouts, Jr.,** senior production engineer, Kilgore, Tex., to Houston; **D. E. Jones,** production engineer, Kilgore to Premont, Tex.; and **W. K. Smith,** production engineer, Quitman to Kilgore.

Howard H. Hinson, formerly assistant supervising engineer of the U. S. Bureau of Mines' helium plants at Amarillo, Tex., has been appointed chief engineer of Continental Oil Co.'s production research section. When he was with the bureau Hinson supervised research in reservoir engineering and natural gas and had charge of all government-owned gas fields and pipe lines supplying gas to helium plants.

Dr. John M. Pearson, director of the physical division of the research and development department of Sun Oil Co., and **Dr. Ulick R. Evans,** who has been associated with Cambridge University since 1919, have been named recipients of the 1948 awards of the National Association of Corrosion Engineers. Evans has been honored with the Willis Rodney Whitney award in corrosion science and Pearson with the Frank Newman Speller award in corrosion engineering. Presentation of the awards will be made at the association's annual

banquet April 7 during the annual conference and exhibition at Hotel Jefferson, St. Louis, April 5-8.

G. C. Baker, materials chief for Caribbean Petroleum Co., is in New York on a visit from Maracaibo.

Dr. Harold Naidus, senior chemist for Publicker Industries, has joined the research staff of American Polymer Corp., Peabody, Mass., to do research and development work in high polymers.

Lyle McDonald, vice president and comptroller of Public Service Electric & Gas Co., Newark, N. J., has been elected a member of the finance committee of the American Gas Association.

E. J. Montgomery, tax and general accounting supervisor for Stanolind Oil & Gas Co., has been made chief accountant and will be in charge of the general, producing, manufacturing, and exploration accounting and oil and gas settlements sections. **R. M. McGowen,** section head of the tax section for Stanolind, has been appointed tax accountant in charge of the tax section.

Charles E. Simons, vice president and general manager of the Texas Mid-Continent Oil and Gas Association, Dallas, announced that the following members have been elected to serve as the organization's advisory committee to the Interstate Oil Compact Commission for 1948: **Curtis Condra,** Stanolind Oil & Gas Co., Fort Worth; **A. E. Groff,** Shell Oil Co., Inc., Houston; **Marshall Newcomb,** Lone Star Gas Co., Dallas; **Scott Myers,** Unity Oil Co., Beaumont; and **Jay Taylor,** Baker & Taylor Drilling Co., Amarillo.

SHIFTS—

Roy Coleman, superintendent, Rocky Mountain Drilling Co., Bakersfield, Calif., to Grants Pass, Ore.; **D. E. Carr,** engineer, Union Oil Co. of California, Los Angeles, Calif., to Bartlesville, Okla.; **James E. Fuller,** superintendent, Rocky Mountain Drilling Co., Montebello to Compton, Calif.; **James S. Hopkins,** foreman, Amerada Petroleum Corp., Santa Barbara to Santa Ana, Calif.; **Charles A. Steen,** geologist, Stanolind Oil & Gas Co., Del Rio to San Antonio, Tex.

Clyde Waugaman, superintendent, Fullerton Oil Co., Andrews to Port Lavaca, Tex.; **J. E. Elkin, Jr.,** geologist, Humble Oil & Refining Co., Dallas to Kingsville, Tex.; **Lamar W. Davis, Jr.,** engineer, Humble Oil & Refining Co., Genoa to Sugarland, Tex.; **Frank Morrow Pool,** engineer, Humble Oil & Refining Co., Genoa to San Angelo, Tex.; **James L. Devault,** superintendent, Rowan Drilling Co., Houston to Kermit, Tex.; **John M. Fouts, Jr.,** engineer, Shell Oil Co., Inc., Kilgore to Houston, Tex.

G. K. Chappell, superintendent, Phillips Petroleum Co., Phillips, Tex., to Kaw, Okla.; **Raymond E. Feasel,** engineer, Republic Oil Refining Co., Texas City, Tex., to Blackwell, Okla.; **Richard S. Reed,** engineer, Monsanto Chemical Co., Texas City, Tex., to St. Louis, Mo.; **Mack Samford,** geologist, Humble Oil & Refining Co., Tyler to Wichita Falls, Tex.; **Fred E. Simmons, Jr.,** engineer, Louisiana Land & Exploration Co., Houma to New Orleans, La.

E. P. Rosser, superintendent, Noble Drilling Co., Rangely, Colo., to New Orleans, La.; **G. A. Gresham,** superintendent, Helmerich & Payne, Inc., Ulysses to Garden City, Kans.; **George E. Briggs, Jr.,** engineer, Stanolind Oil & Gas Co., Ulysses, Kans., to Wewoka, Okla.; **Glenn H. Lancaster,** engineer, Stanolind Oil & Gas Co., Midwest, Wyo., to Rangely, Colo.

J. J. August, foreman, General Petroleum Corp., Powell, to Casper, Wyo.; **Joe Tracy Williams,** foreman, Carter Oil Co., Rock Springs to Powell, Wyo.; **L. H. Simpson,** superintendent, Helmerich & Payne, Inc., Chickasha to Marlow, Okla.; **Robert W. Chesney,** geologist, Magnolia Petroleum Co., Lindsay, Okla., to Baltimore, Md.

DEATHS

Edward F. Moran, 52, head of E. F. Moran, Inc., drilling contracting firm, died March 8 in Tulsa. Prior to forming his own company, Moran had been associated with Cosden Oil Corp. and The Texas Co. Moran was the brother of Dan Moran, former president of Continental Oil Co., and the son of the late Martin Moran, one time president of Texas Pipe Line Co.

Felix J. Skowronski, 60, chemical engineer for M. W. Kellogg Co., died March 5 in Elizabeth, N. J. Before joining Kellogg Skowronski had been an engineer for Atlantic Refining Co. and Sinclair Refining Co. He had worked also in the research department of Universal Oil Products Co., Chicago.

Ennis T. Oakes, 64, independent oil operator of Shreveport, died March 1 in Shreveport. He was credited with having brought in Lisbon oil field near Homer, La., in the middle thirties.

Dr. Nelson H. Darton, about 80, internationally known petroleum geologist and whose name was taken for the Darton arch, which crosses several Mid-Continent states, died February 28 in Chevy Chase, Md.

Thomas R. Freeman, 55, attorney for Atlantic Refining Co. for the past 25 years, died March 1 in Dallas.

U. G. Ralph, 38, superintendent for J. R. Horrigan Construction Co., was killed March 6 in an automobile accident near Mount Pleasant, Mich.

Conrad E. Brown, 32, in charge of a United Geophysical Co. crew working on the Navy oil-exploration project in Alaska, was killed February 26 in an accident at Point Barrow, Alaska.

Arthur Shippen Maitland, 72, at one time manager of the tankage department for National Transit Co. and later secretary-treasurer of Petroleum Iron Works Co., Sharon, Pa., died March 1 in Ozona, Fla.

Clarence G. Pepoon, 57, eastern division manager for Pure Oil Co.'s retail marketing operations, died March 6 in Evanston, Ill.

Fred Day, 32, Stanolind Oil & Gas Co. engineer, was found dead March 1 near High Island, Chambers County, Texas.

H. I. Lyvers, Houston oil operator associated with Gilger Drilling Co., Ltd., was killed March 5 in an automobile accident near Sinton, Tex.

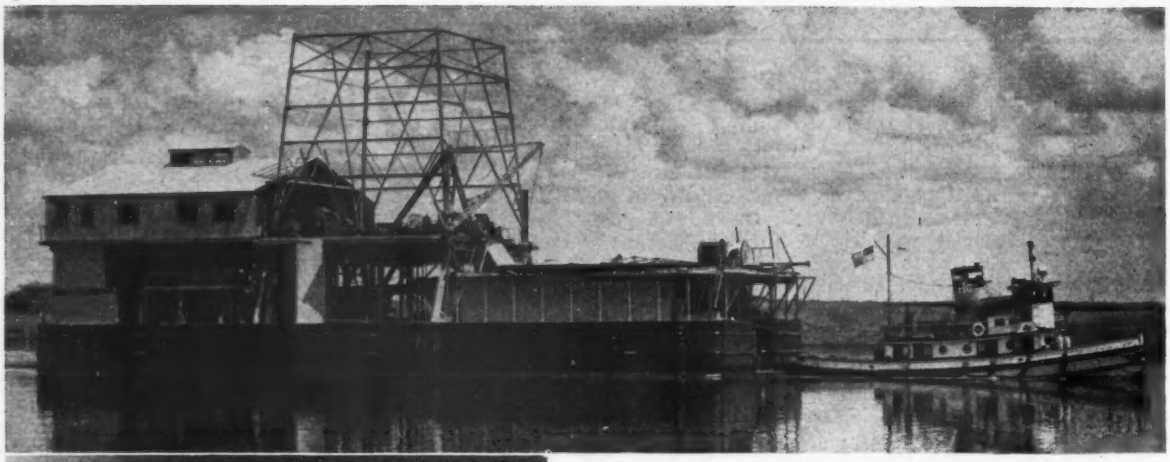
Martin A. Fullerton, 54, chief accountant for Atlantic Refining Co., died March 2 in Collingswood, N. J.

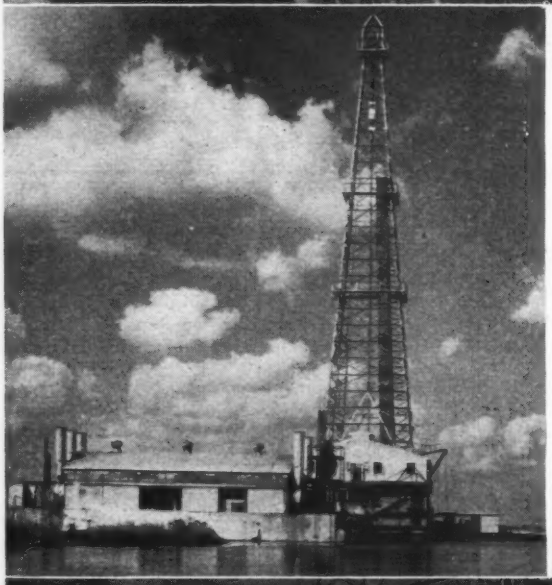
Obediah R. Landers, 65, engineer for Lone Star Gas Co. since 1922, died February 26 in Joshua, Tex.

A. F. Mortimer, 76, formerly superintendent for Benedum-Trees Oil Co. in Oklahoma, died recently in Okmulgee, Okla.

Carl D. Ruff, 68, retired assistant treasurer for Texas Empire Pipe Line Co. and Kaw Pipe Line Co., died March 2 in Tulsa.

Saul Singer, 66, former chairman of the board of Pontiac Refining Corp., Corpus Christi, Tex., died March 1 in Miami Beach, Fla.

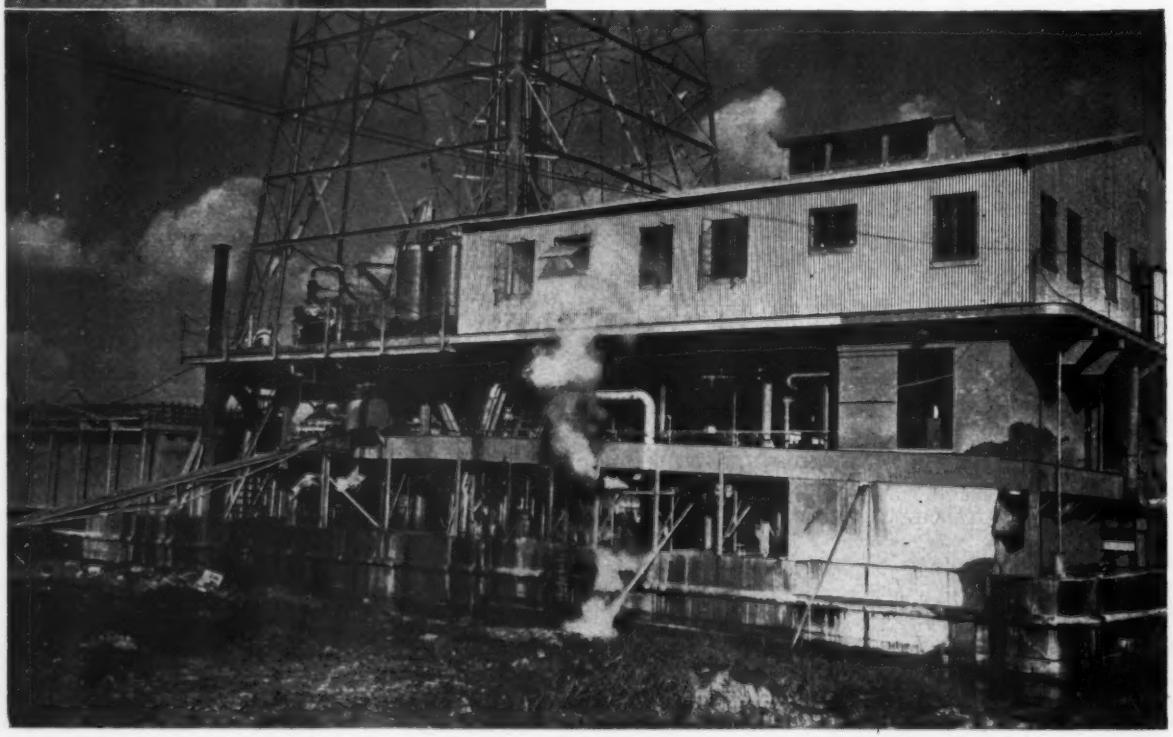




Above: Built at Beaumont, the Shell barge drilling rig was towed through the Intercoastal Canal to Weeks Island, Louisiana

Left: On location at Weeks Island, this steam rig will be used by Shell in routine drilling to 14,000 ft. Five 150-lb. working-pressure boilers will deliver 2,250 hp. on a 300-per cent rating

Below: Single-hull barge is 152 ft. long, 54 ft. wide, and 14 ft. deep, and when fully loaded carries a weight of approximately 1,000 tons, not including water and mud supply. The barge has an 8-ft.-wide slot extending 84 ft. from the forward end to allow it to slide off and on locations. The 15-ft. superstructure of the derrick is of special design and is welded directly to the barge. Each superstructure leg is capable of supporting 300,000 lb. and the 236 36-in. round beams, which support the rotary, are capable of handling a load of 700,000 lb. in the center. Weighing 1,984,000 lb. when fully loaded, the barge draws only 5½ to 7 ft. of water (depending on material aboard), and is easily floated from location to location in shallow areas. The derrick floor beams, pipe-rack beams, and plate beneath the pipe rack are all galvanized as well as the entire derrick



POWER and CONTROL Are Salient Feature of Shell's New

SUPER DRILLING BARGE

by Ed Short

NEARLY 2 years ago Shell Oil Co., Inc., began the design of a powerful steam rig capable of drilling to 18,000 ft. During the design period an exhaustive investigation was made with regard to each component part of such a rig, to insure the incorporation of the most recent developments in equipment and controls into the proposed rig.

Recently this rig, said to be the most powerful in the world, was completed and towed to Weeks Island, Iberia Parish, Louisiana, where it will be used, for the present, in drilling 14,000-ft. wells.

Power and Control

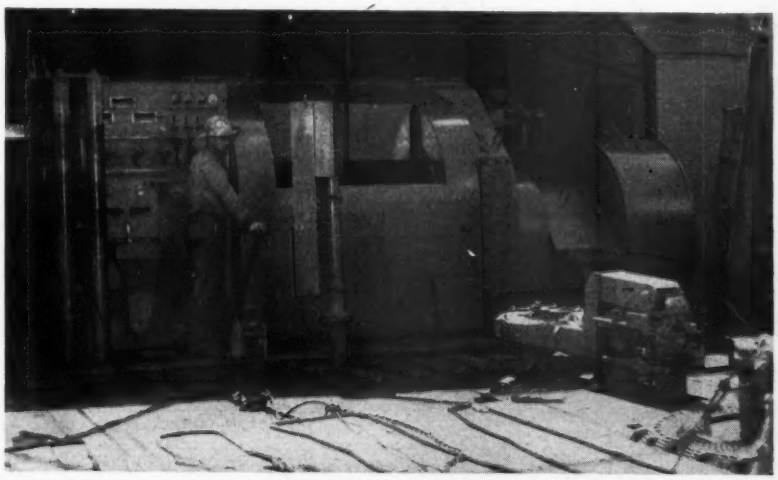
Power and control are the salient features of this new Shell super drilling barge. Steam power is furnished by five 150-hp., 350-lb.-working-pressure boilers, which, on a 300 per cent rating, are capable of delivering 2,250 hp. Provisions have been made in the design of the boiler barge for the installation of a sixth boiler on demand of additional steam, which would increase the available horsepower to 2,700.

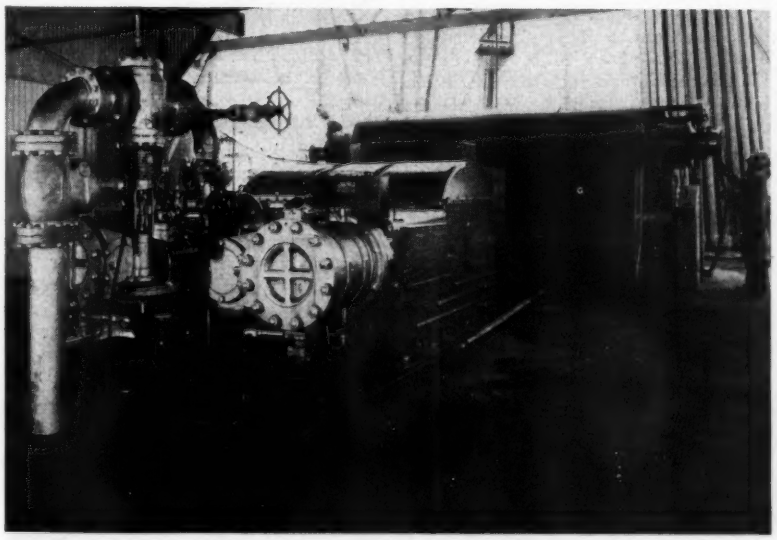
Power to the draw works is furnished by a 16-by-16-in. twin-cylinder horizontal steam engine with a rating of 1,790 b.hp. at 350 r.p.m. when using 350-psi. saturated steam.

This rig is equipped with the Emsco J-2000 draw works, the largest ever built. It is capable of handling any weight of pipe now designed. The drum, 60 in. long with an 11-in. shaft, has a theoretical load capacity of 30,000 ft. of 4½-in. drill pipe weighing 510,000 lb. An electrically operated 60-in. dynamatic brake will slow down the drum to 150 r.p.m. with a 480,000-lb. load.

Located under the derrick floor, a 12-by-12-in. steam engine drives the rotary table. The engine, equipped with an air-controlled steam throttle valve, is connected to the rotary through a special jack shaft which has a cathead and a special brake drum with an air brake for stopping the rotary.

The two main mud pumps are 19 by 7¾ by 22 in., equipped with air-operated steam throttles. Either of these pumps requires approximately 1,000 hp. input at peak operations and will develop 2,900 psi. operating pressure





***Above:** The first installation of the largest draw works ever constructed was made on this rig. By having an intermediate transmission it may be used with either a steam engine, straight mechanical power, or an electric-motor drive. The J-2000 draw works unit is rated at 2,000 input horsepower and has four speeds and a 34-in.-diameter by 60-in.-long ungrooved drum with 60-in.-diameter brake rims. All clutches are pneumatic and an air-actuated steam throttle controls the speed of the engine*

***Left:** This 16-by-16-in. twin-cylinder horizontal steam engine which powers the draw works has a rating of 1,790 b.hp. at 350 r.p.m. when using 350-psi. saturated steam*

Left: Reaching up 225 ft. into the low-hanging clouds of the Louisiana marshlands, this 185-ft. derrick has an A.P.I. load rating of approximately a million pounds. This derrick has 31-ft. clearance in the "V" and a 15-ft. 15-ton-capacity gin pole. Girts to support thribble boards are provided for three joints of either range 2 or range 3 drill pipe and a safety platform is provided at each position. Center: A control panel on the driller's side includes air-operated valves which control air throttles on the mud pumps, and the rotary engine, and also the air valves and accelerators for operating the hoist speeds, cathead, etc. The draw-works drum shaft is equipped with the largest dynamatic, eddy-current brake on the market. Right: Air view showing equipment barge being nudged into place by tug boat

with 6¼-in. liner. The maximum output of mud at this pressure is approximately 500 g.p.m. The transfer and circulation pump, which also acts as a standby, is a 15½-by-8½-by-20-in. pump.

A 30-ft. 10-ton capacity boom simplifies loading problems. Not shown in the photo is the slot cut in the upper deck of the starboard or water side to allow subs, special tools, etc., to be loaded aboard with the catline

To speed up the trip operations the rig was equipped with air-operated slips. An "intercom" system is planned for communication between the driller, the derrickman, and the fireman. The derrick is 185 ft. high with a 952,000-lb. A.P.I. rating, and has a 40-ft.-square base. The rig, equipped with an outsize traveling block weighing 19,000 lb., handles 135-ft. triple stands of 5-in. drill pipe. The coring reel for this rig is separately powered by a 9-by-8-in. horizontal steam engine and is a heavy-duty unit capable of holding 18,000 ft. of ⅝-in. coring line. The coring reel has a cathead extending from the drum shaft to be used for various types of light hoisting work.

Drill pipe for the rig consists of 15,000 ft. of 5-in. o.d. by 19.40-lb. internal-upset pipe with 4½-in. internal flush tool joints. This pipe varies in length from 42 to 45 ft. and allows 135-ft. thribble stands to be pulled. Use of this 5-in. pipe permits greater circulation of mud and safer and faster drilling.

The Drill Barge

One of, or possibly the largest of its kind, the single-hull drill barge is 152 ft. long by 54 ft. wide and 14 ft. deep. The hull is divided into six main compartments and with collision compartments in the rake of each end. The main compartments are used for submergence water and two smaller compartments can be used to store fresh water. The barge is sunk to bottom by opening a sea cock in each compartment and is raised by using steam jets that empty the water overboard.

The boiler barge is 100 ft. long, 34 ft. wide, and 16 ft. deep. It is connected to the drill barge by a 96-ft.-long galvanized structural-steel walkway. Steam and water pipes leading between the boilers and the drilling barge are bracketed to the outside of the walk. The walkway is hinged to the drilling and boiler barge so that it may be raised by a line from the derrick when changing locations.

To keep boiler-water makeup at a minimum quantity, the exhaust steam from all larger pieces of equipment is directed into a 2,000-sq.-ft. condenser on the drilling barge and the condensate is returned to the boiler barge. Condenser cooling water is pumped from the bayou by a turbine pump on the barge.

All feed water is heated by a deaerating heater capable of heating 60,000 lb. of water per hour from 60° to 225° F. A 4-in. gas regulator is used to control the natural-gas supply going to the burners. The burners are forced draft, and the fan turbines are controlled by a 1-in. regulator.

When firing with oil, a 1-in. pump governor is controlled from a volume tank to maintain a constant pressure on the burner manifolds. An oil heater is used to preheat the oil to any desired temperature up to 180° F. prior to its entrance into the burner. The feed-water pumping equipment used on this barge consists of two 10-by-6-by-10-in. pumps and two 10-by-4½-by-10-in. pumps.

The piping design of the steam lines eliminates all unnecessary friction losses. The main header leading to the drilling barge is 8-in. pipe rather than 6-in. which is often used. All lines are insulated.

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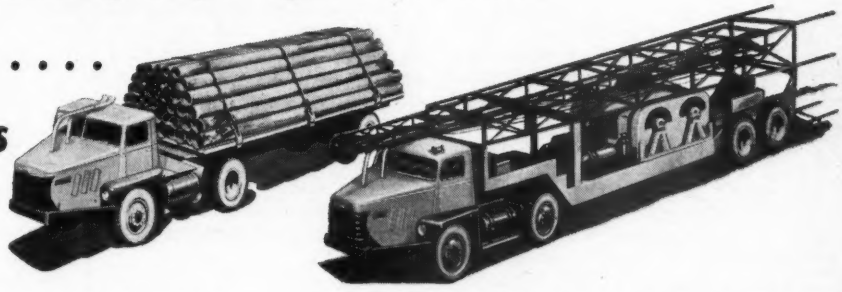

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THE EFFECT OF Sulfur Compounds on Octane Number OF LEADED FUELS

1 — COMPARISON OF DIFFERENT SULFUR COMPOUNDS

*by H. K. Livingston**

SULFUR, even at the relatively low concentrations (0.01-0.10 per cent) that occur in present-day motor fuels, causes a significant reduction in the octane number of gasolines containing tetraethyl lead. In nonleaded gasolines it has very little effect on the octane number. For example, 2.65 g. (0.10 per cent elementary sulfur in a gallon of 60-isooctane:40-heptane blend has a barely measureable effect on the octane number of the fuel, but if 3 cc. tetraethyl lead per gallon is added to this sulfur-containing fuel, the octane rise obtained will correspond to that obtained on the addition of 1.3 cc. tetraethyl lead per gallon to the same blend in the absence of sulfur. That is, 1.7 cc. tetraethyl lead per gallon has been effectively lost through the antagonistic action of the sulfur. This corresponds to a loss of 1.06 g. of tetraethyl lead per gram of sulfur in this particular example. The exact magnitude of this effect will vary with the sulfur and tetraethyl lead concentration and with the nature of the fuel and the type of chemical combination in which the sulfur occurs.

This effect of sulfur on the antiknock action of tetraethyl lead was reported independently during the period 1934-36 by three different groups of investigators: Schulze and Buell[18] in the United States, Endo in Japan[9], and Birch and Stansfield[4] in England. Since that time, the phenomenon has been thoroughly investigated from the refining standpoint[7,10,12a,13,14,15,16,20,25]. However, the chemistry of the antagonistic action of sulfur compounds in leaded fuels is not well understood at the present time.

SULFUR antagonism is of major importance as a clue leading to a better understanding of the mechanism of the antiknock action of tetraethyl lead and as a limitation in the commercial utilization of tetraethyl lead as an antiknock. The present paper deals with the comparison of the antagonistic action of a large number of sulfur compounds of widely differing types. Other phases of the investigation, to be published later in the Journal, are concerned with the measurement of the sulfur effect in different fuels by different octane-rating methods and the interpretation of the chemistry of sulfur antagonism.

A major objective of the present paper is the presentation of accurate and self-consistent data describing the effect of pure sulfur compounds on the antiknock performance of tetraethyl lead. It was necessary to choose a base fuel that was sulfur free and of a constant composition. The primary reference fuels made by blending isooctane and heptane fulfill these requirements, and furthermore have the advantage of a high lead susceptibility (and therefore a wide range of octane numbers over which sulfur antagonism could be observed). For the phase of the investigation reported in this paper all tests were carried out under the following fixed conditions:

Fuel.—60 - isooctane:40 - heptane blend.

TEL concentration.—3 cc. per gallon (added as a mixture with 1 mol ethylene dichloride and ½ mol ethylene dibromide per mol tetraethyl lead).

Fuel - rating method. — A.S.T.M. Method D-357-46 (motor method).

The particular proportions of isooctane, heptane, and tetraethyl lead used were chosen so as to give octane numbers for sulfur-containing fuels that would lie in the present-day commercial range.

Compounds Tested

Almost 200 sulfur compounds have been considered for test in leaded reference fuel. Many of these were not sufficiently soluble to be tested at the sulfur concentration (0.1 per cent) that was used as standard for this work. Octane-number determinations were made with 132 compounds, of which 83 were compounds of carbon, hydrogen, and sulfur only. It is generally believed[3,10,11,21] that the sulfur compounds found in gasoline con-

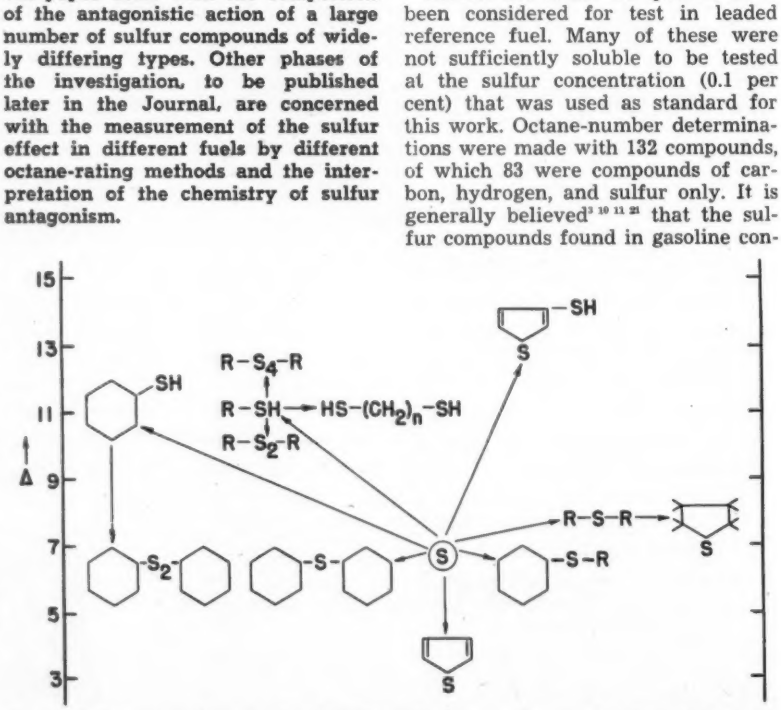

Fig. 1—Sulfur antagonism as a function of structure. Δ = decrease in octane number of a 60-isooctane : 40-heptane blend containing 3 cc. TEL per gallon on the addition of 0.1 per cent sulfur

*E. I. du Pont de Nemours & Co.

tain only these three elements, so major emphasis has been placed on this group of compounds. The results obtained with the remaining 49 compounds, which contained oxygen, nitrogen, phosphorus, chlorine, or boron, as well as sulfur, carbon, and hydrogen, are not considered in detail in this paper.

In the previously published work dealing with the effect of sulfur compounds on the octane number of fuels, no particular attention was paid to the purification of the sulfur compounds used, except in the work of Ryan,[20] where all sulfur compounds were distilled prior to use. In the present investigation, the lower members of all the homologous series were checked for purity by determining the index of refraction and were purified if the index of refraction differed from the literature value for n_D by as much as 0.001.

Purification was accomplished by distillation at 6 to 1 reflux ratio in a still with a 1 by 12-in. column packed with ⅛-in. glass helices. The purity of the higher members of the series, which were generally too-high-boiling to be in the gasoline range and therefore of secondary interest, was not specially investigated. The highest members of the series for which the purity was established, for the various classes of compounds investigated, were:

Mercaptans—$C_5H_{12}S$
Dithiols—$C_3H_6S_2$
Sulfides—$C_{14}H_{30}S$
Disulfides—$C_{10}H_{22}S_2$
Thiophenes—C_8H_8S

Polysulfides—There are no reliable n data for polysulfides other than ethyl tetrasulfide. The compounds were prepared from mercaptans and sulfur chlorides by the method of Chakravarti[8] and all low-boiling compounds were removed by distillation.

Each of the purified sulfur compounds, when used, had an n_D value within 0.001 unit of the value given in the extensive summary of Haines, Wenger, Helm, and Ball,[12] with the exception of the following compounds, for which their value could not be duplicated:

Compound—	n_D^{20} (Ref. 12)	Observed n_D^{20}	n_D^{20} from other ref.
2-Methyl-1-propanethiol	1.439	1.430	....
2-Methyl-2-propanethiol	1.423	1.418	....
2-Methyl-2-butanethiol	1.438	1.432	....
1,2-Ethanedithiol	(*)	$n_D^{25} = 1.554$	$n_D^{25} = 1.556$ (Ref. 24)
Thiapropane	1.436	1.432	....
2-Thiahexane	1.448	1.446	....
2,4-Dimethyl-3-thiapentane	1.439	1.437	....
3-Thiaheptane	1.449	1.447	....
4-Thia-1,6-heptadiene	1.491	1.489	1.488 (Ref. 18)
2,4-Dimethyl-3-thiaheptane	1.451	1.448	....
8-Thiapentadecane	(*)	1.4604	1.4605 (Ref. 25)
1-p-Tolyl-1-thiaethane	1.573	$n_D^{16} = 1.575$	$n_D^{16} = 1.575$ (Ref. 2)
Tetrahydrothiophene	1.49	1.4897	....
3,4-Dithiahexane	1.507	1.505	....
4,5-Dithiaoctane	1.498	1.495	....
5,6-Dithiadecane	1.492	1.479	....
2,2,5,5-Tetramethyl-3,4-dithiahexane	1.490	1.487	....
3,4,5,6-Tetrathiaoctane	(*)	1.618	1.618 (Ref. 5)
3-Methylthiophene	1.522	1.519	....
Carbon disulfide	....	1.6273	1.6276 (Ref. 17)

*No data.

Note: The nomenclature for sulfur compounds recommended by Ball and Haines[4] will be used in this paper. This involves the thiaalkane nomenclature for sulfides (thia indicating the point at which —S— replaces —CH_2— in the hydrocarbon chain). Chemical abstract rules[19] permit the use of this nomenclature only for very complicated compounds, however, for work devoted solely to sulfur compounds, the thia nomenclature has a great advantage in simplicity over the sulfide nomenclature commonly used by chemical abstracts.

Experimental Results

The main classes of compounds tested were monothiols (mercaptans), dithiols, sulfides, disulfides, tetrasulfides, and thiophenes. Thiophenes, aryl sulfides, and aryl disulfides decrease the octane number of leaded gasoline less, under the test conditions used, than does elementary sulfur. In all the other classes of compounds, the sulfur is more antagonistic than it is as elementary sulfur (Fig. 1). The results can be summarized conveniently in terms of the decrease (Δ) in motor-method octane number that occurs in a 60-isooctane: 40-heptane blend containing 3 cc. tetraethyl lead per gallon on the addition of a sulfur compound. Majority of the tests in this program, and all those for which results are given in the following eight tables, were carfur, sulfides, disulfides, thiols, tetrasulfides. It is noteworthy that thiophenethiol was the most active of the CHS compounds tested.

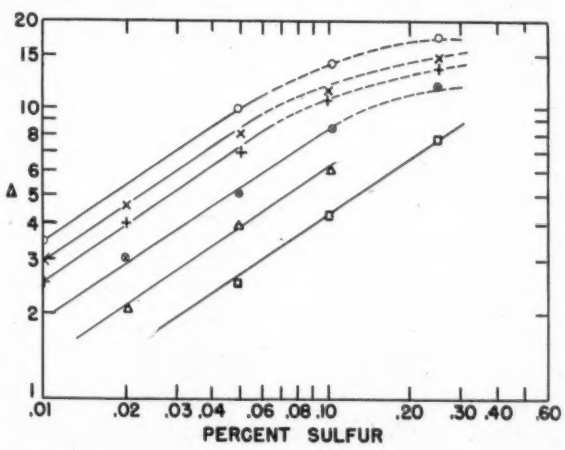

Fig. 2—Octane number decrease (Δ) as a function of sulfur concentration for various classes of sulfur compounds. (Logarithmic plot)

The octane number data for individual compounds are given in Tables 2 to 7. The data are given to the nearest whole number only. In testing these sulfur compounds, particular attention was given to problems of solubility and stability. Tests were not run on compounds not sufficiently soluble to give 0.1 per cent S concentration or on samples that showed any phase separation. Care was taken to minimize the possibility of changes in octane number taking place before the samples were rated.

Apparently all unsubstituted thiols have the same antagonistic effect in this leaded fuel, within a limit of ±1 ried out with an amount of sulfur compound which would give 0.1 per cent sulfur (by weight) in the fuel. The data for the various classes of compounds (limited to those containing carbon, hydrogen, and sulfur only) then show (Table 1) the antagonism toward tetraethyl lead to increase in the following order: thiophenes, sul-

TABLE 1
Octane Number of 60-Isooctane : 40-Heptane Reference Fuel Containing 3 cc. TEL per Gallon, as Affected by Various Classes of CHS Compounds at 0.1 per cent S Concentrations

Compound or class—	Octane No.	Δ
Nothing added	83	0
Thiophenes	79	4
Aryl sulfides	77	6
Aryl disulfides	77	6
Sulfur	76	7
Alkyl sulfides	75	8
Alkyl disulfides	73	10
Aliphatic dithiols	72	11
Monothiols (aliphatic or aromatic)	72	11
Tetrasulfides	70	13
Thiophenethiol	69	14

TABLE 2

Octane Number of Leaded Reference Fuel, as Affected by Various Thiols at 0.1 Per Cent Concentration

Compound or class—	Octane No.	Δ
Nothing added	83	0
Methanethiol	72	11
Ethanethiol	72	11
1-Propanethiol	72	11
2-Propanethiol	72	11
1-Butanethiol	71	12
2-Methyl-1-propanethiol	72	11
2-Butanethiol	72	11
2-Methyl-2-propanethiol	72	11
1-Pentanethiol	71	12
2-Methyl-2-butanethiol	72	11
4-Methyl-2-pentanethiol	73	10
Cyclohexanethiol	73	10
"tert.-Hexyl mercaptan"	72	11
"tert.-Heptyl mercaptan"	72	11
"tert.-Octyl mercaptan"	72	11
1-Octanethiol	72	11
1-Decanethiol	73	10
1-Dodecanethiol	72	11
"tert.-Dodecyl mercaptan"	71	12
"tert.-Tetradecyl mercaptan"	71	12
Benzenethiol	71	12
Phenylmethanethiol	72	11
1-Phenyl-1-ethanethiol	72	11
2-Phenyl-1-ethanethiol	72	11
2-Mercaptobenzoic acid methyl ester	73	10
1,2-Ethanedithiol	71	12
1,2-Propanedithiol	71	12
1,10-Decanedithiol	72	11
2,3-Propanetrithiol	72	11
β-Mercaptoethyl borate	73	10
Unleaded fuel	60	..

TABLE 3

Octane Number of Leaded Reference Fuel, as Affected by Various Sulfides (Monothia Compounds) at 0.1 Per Cent S Concentration

Compound or class—	Octane No.	Δ
Nothing added	83	0
2-Thiapropane	75	8
2-Thiabutane	75	8
3-Thiapentane	74	9
2-Thiahexane	75	8
3-Thiahexane	75	8
2-Thiaheptane	75	8
3-Thiaheptane	75	8
4-Thiaheptane	75	8
2,4-Dimethyl-3-Thiapentane	75	8
4-Thia-1,6-heptadiene	74	9
4-Thiaoctane	75	8
5-Thianonane	75	8
2,6-Dimethyl-4-thiaheptane	75	8
3,5-Dimethyl-4-thiaheptane	75	8
8-Thiapentadecane	74	9
2-Methyl-4-thia-1-hexadecane	75	8
1-(p-Tolyl)-1-thiaethane	78	5
1-(p-Tolyl)-1-thiapropane	77	6
1,3-Diphenyl-2-thiapropane	77	6
Thiacyclobutane	76	7
Thiacyclopentane	75	8
3-Thia-1-pentanethiol	72	11
6-Chloro-3-thia-1-hexanethiol	72	11
Unleaded fuel	60	..

TABLE 4

Octane Number of Leaded Reference Fuel, as Affected by Various Disulfides (Dithia Compounds) at 0.1 Per Cent S Concentration

Compound or class—	Octane No.	Δ
Nothing added	83	0
3,6-Dithiaoctane	75	8
1,4-Dithiaspiro-(4,5)-decane	76	7
2,3-Dithiabutane	74	9
3,4-Dithiahexane	73	10
4,5-Dithiaoctane	74	9
5,6-Dithiadecane	74	9
2,2,5,5-Tetramethyl-3,4-Dithiahexane	72	11
6,7-Dithiadodecane	73	10
2,9-Dimethyl-5,6-dithiadecane	74	9
"tert.-Hexyl disulfide"	73	10
1,2-Diphenyldithiaethane	77	6
1,4-Diphenyl-2,3-dithiabutane	77	6
Unleaded fuel	60	..

TABLE 5

Octane Number of Leaded Reference Fuel, as Affected by Various Tri and Tetrasulfides (Polythia Compounds) at 0.1 Per Cent Concentration

Compound or class—	Octane No.	Δ
Nothing added	83	0
3,4,5-Trithiaheptane	69	14
2,3,4,5-Tetrathiahexane	70	13
3,4,5,6-Tetrathiaoctane	70	13
2,2,7,7-Tetramethyl-3,4,5,6-tetrathiaoctane	69	14
Unleaded fuel	60	..

TABLE 6

Octane Number of Leaded Reference Fuel, as Affected by Various Thiophenes at 0.1 Per Cent S Concentration

Compound or class—	Octane No.	Δ
Nothing added	83	0
Thiophene	79	4
2-Methylthiophene	79	4
3-Methylthiophene	79	4
2-tert.-Butylthiophene	78	5
3,4-Dimethoxythiophene	77	6
2-Thenyl alcohol	78	5
2-Thiophene aldehyde	77	6
2-Chlorothiophene	76	7
2-Chloromethylthiophene	74	9
Di-2-thenyl amine	79	4
3-Thiophenethiol	69	14
Unleaded fuel	60	..

TABLE 7

Octane Number of Leaded Reference Fuel, as Affected by Sulfur and Some of Its Compounds at 0.1 Per Cent Concentration

Compound or class—	Octane No.	Δ
Nothing added	83	0
Sulfur	76	7
Hydrogen sulfide	72	11
Sulfur dioxide	72	11
Carbon oxysulfide	80	3
Carbon disulfide	76	7
Ethyl thiolacetate	75	8
Butanesulfonyl chloride	67	16
Butyl sulfone	77	6
iso-Propyl sulfite	75	8
Butyl sulfite	75	8
Allyl N,N-dimethyl-dithiocarbamate	73	10
Tetraethyl thiuram sulfide	77	6
Tetrabutyl thiuram disulfide	74	9
Dodecyl ethyl xanthate	75	8
Bis-(isopropyl xanthogen)	74	9
1,4-Thioxane	77	6
Phenothioxin	80	3
Thialdine	70	13
2-Octylmercaptothiazoline	73	10
Unleaded fuel	60	..

octane number, and this generalization applies not only to alkanethiols but to cycloalkanethiols, benezenethiol, and aryl alkanethiols (see Table 2). Chlorination of benzenethiol increases the over-all antagonism, but if an allowance is made for the antagonistic action of the chlorine the actual effect of the thiol group on the efficiency of tetraethyl lead is found to be unaffected by chlorination (see Table 8).

Among the sulfides, the same degree of antagonism (±1 octane number) is found with all members of the alkyl series, but the alkyl aryl and diaralkyl sulfides are significantly less antagonistic. The thiaacycloalkanes (i.e., cyclic sulfides) are equivalent to alkyl sulfides in their effect on leaded gasoline. Introduction of an —SH group appears to raise the antagonistic activity of both sulfurs (or at least the average of their activities) to the thiol value (see Table 3). Oxidation of sulfides to sulfones reduces the activity, according to the single result available, while the one alkanesulfonyl chloride tested was extremely active in reducing the octane number (see Table 7). This very marked antagonism of sulfonyl chlorides is no doubt due in some measure to the chlorine atom.

The antagonism of disulfides varies with the position of the sulfide groups. Nonvicinal disulfides have the same effect as monosulfides, while the vicinal sulfides (the oxidation products of mercaptans) are intermediate between monosulfides and mercaptans in their antagonism towards tetraethyl lead. There is an indication that tertiary-alkyl disulfides are somewhat more antagonistic than other alkyl disulfides. Aryl and alkaryl disulfides are no more effective in reducing the octane number of leaded fuel than are the aryl sulfides (see Table 4). While oxidation of a mercaptan (to disulfide) reduces the antagonism, sulfurization (to trisulfide or tetrasulfide) increases it (see Tables 2, 4, and 5). Substitution of Thiophenes, particularly with electronegative groups, renders the sulfur compound much more antagonistic (see Table 6).

General Trends

Certain general trends can be discerned in the data of Tables 2-8:

TABLE 8—OCTANE NUMBER OF LEADED REFERENCE FUEL, AS AFFECTED BY CHLORINATED BENZENES AND BENZENETHIOLS

Base compound—	Benzene	Chlorobenzene	1,4-Dichlorobenzene
Related benzenethiol—	Benzenethiol	4-Chlorobenzenethiol	2,5-Dichlorobenzenethiol
Results with benzenethiols:			
Concentration as per cent S	0.10	0.10	0.10
Concentration as per cent Cl	....	0.11	0.22
Octane number*	71	69	67
Δ	12	14	16
Effective TEL concentration, cc. per gal.	0.7	0.5	0.4
Results with benzenes:			
Concentration as per cent Cl	....	0.11	0.22
Octane number	....	81	78½
Δ	....	2	4½
Effective TEL concentration, cc. per gal.	3.0	2.25	1.65
Net loss in TEL efficiency due to thiol group, per cent	77	78	76

*For a 60-octane-number reference fuel containing 3 cc. TEL per gallon.

1. Sulfur combined with oxygen or in oxygen-containing compounds has a relatively low antagonistic action. The decrease in octane number varies from a maximum of eight (in sulfites and thio esters) to a minimum of three (in phenothioxin).

2. Sulfur combined with nitrogen or nitrogen-containing heterocyclics has a relatively high antagonistic action. The decrease in octane number varies from a minimum of 6 (in a thiuram monosulfide) to a maximum of 13 (in thialdine).

3. The Δ-value for compounds containing chlorine and sulfur generally corresponds to the value that would be predicted from a knowledge of the independent effects of the chlorine and sulfur atoms.

In any discussion of the effect of sulfur compounds on leaded gasoline, their effect on unleaded fuel must be considered. In the primary reference fuel used in this work (60-isooctane : 40-heptane), the various sulfur compounds tested may reduce the octane number by as much as two units when added at 0.1 per cent S concentration, although thiophenes have no effect (Table 9). Tetrasulfides reduce the octane number even more than thiols (for example, see Ryan[20]).

TABLE 9—EFFECT OF SULFUR COMPOUNDS ON UNLEADED REFERENCE FUEL

Compound—	Oct. No. at 0.1% sulfur concentration
Nothing added	60
Ethanethiol	58
2-Methyl-1-propanethiol	58
1-Pentanethiol	58
2,3-Dithiabutane	59
3,4-Dithiahexane	59
Sulfur	59½
3-Methylthiophene	60

Sulfur-Concentration Studies

The octane number of leaded gasolines containing 0.01-0.25 per cent S has been determined for certain typical compounds. From the results of the extensive tests carried out at 0.1 per cent S concentration, it was possible to select sulfur compounds that would typify those compounds that are of practical interest. Inasmuch as the logarithm of the decrease in octane number resulting from the addition of the sulfur compound (log Δ) bears a linear relationship to the logarithm of the sulfur concentration (log c), at all except the larger values of Δ, it is convenient to present the results of the concentration studies as log-log plots (Fig. 2). The plots form a series of parallel lines, with displacements corresponding to the relative antagonism of the particular class of compounds. The lines can be characterized by equations of the form:

$$\log \Delta = K_a + K_D \log c$$

where K_a and K_D are the intercept and slope, respectively, of the straight line.

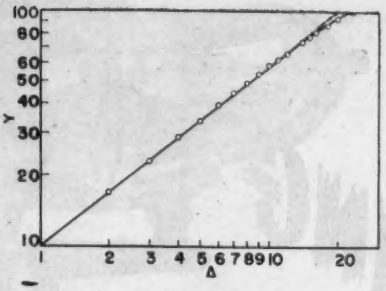

Fig. 3—Y as a function of Δ for 60-octane number primary reference fuel plus 3 cc. TEL per gallon. (Logarithmic plot)

Ryan[20] has observed that his knock-test data for sulfur compounds in a loaded reformed gasoline can be expressed by equations of the form:

$$\log y = K_Y + K_Y \log c$$

where y = per cent decrease in lead susceptibility due to the sulfur compound, as ascertained from his TEL blending chart.

Sulfur antagonism is expressed most directly by Δ, the decrease in octane number, but the decrease in the efficiency of the tetraethyl lead is of greater interest from the physical-chemical viewpoint. The decrease in efficiency (designated L) is obtained by subtracting from the actual TEL concentration the TEL concentration of sulfur-free fuel that corresponds to the observed octane number, and dividing by the actual TEL concentration. For the present fuel, L (in per cent) = 3 — a/3 × 100, where a is the TEL concentration of S-free fuel at the observed octane number. The loss in lead efficiency, expressed in this way, also bears a logarithmic relationship to log c. Thus:

$$\log L = K_L + K_L \log c$$

The effect of sulfur on the knock rating of 60 - isooctane : 40 - heptane blends containing 3 cc. TEL per gallon may be expressed in terms of Δ, y, or L. Table 10 is a tabulation of the equivalents for each octane number from 63 to 83, and can be used in converting data in Tables 2 to 8 to y or L values.

TABLE 10—CONVERSION TABLE

Octane No.	Δ (O.N. units)	Per cent y	Per cent L
83	0	0	0
82	1	10	14
81	2	17	25
80	3	23	33
79	4	29	40
78	5	34	47
77	6	40	53
76	7	45	58
75	8	49	63
74	9	54	67
73	10	59	70
72	11	62	73
71	12	66	77
70	13	70	80
69	14	74	83
68	15	78	85
67	16	81	87
66	17	84	90
65	18	87	92
64	19	90	94
63	20	93	95
60	23	100	100

The fact that linear sulfur concentration plots on log-log paper are obtained in terms of Δ, y, or L is a natural consequence of the mathematical relationship between these quantities. For the particular leaded fuel used in this work:

log y = 1.00 + 0.77 log Δ (accurate below Δ = 12.5; see Fig. 3).

log L = 0.43 + 0.80 log y (range: y = 16 to y = 70; see Fig. 4).

log L = 1.23 + 0.62 log Δ (range: Δ = 1.7 to Δ = 9.6; see Fig. 5).

By means of these equations, the Δ vs. c equations obtained from the straight-line portion of the plots in Fig. 2 may be converted to equations relating y to c or L to c. The complete set of equations thus obtained is:

Thiophenes:

log Δ = 1.30 + 0.68 log c
log y = 2.00 + 0.52 log c
log L = 2.04 + 0.42 log c

Sulfur:

log Δ = 1.46 + 0.68 log c
log y = 2.12 + 0.52 log c
log L = 2.14 + 0.42 log c

Sulfides:

log Δ = 1.59 + 0.68 log c
log y = 2.22 + 0.52 log c
log L = 2.22 + 0.42 log c

Thiols:

log Δ = 1.81 + 0.68 log c
log y = 2.39 + 0.52 log c
log L = 2.35 + 0.42 log c

Tetrasulfides:

log Δ = 1.89 + 0.68 log c
log y = 2.46 + 0.52 log c
log L = 2.40 + 0.42 log c

Disulfides:

log Δ = 1.76 + 0.68 log c
log y = 2.35 + 0.52 log c
log L = 2.32 + 0.42 log c

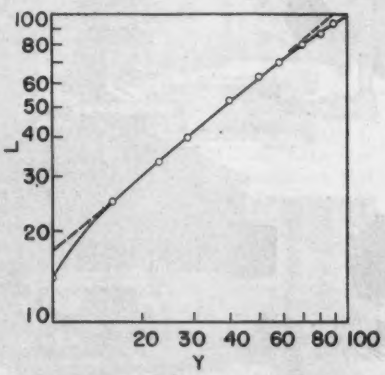

Fig. 4—L as a function of Y for 60-octane number primary reference fuel plus 3 cc. TEL per gallon

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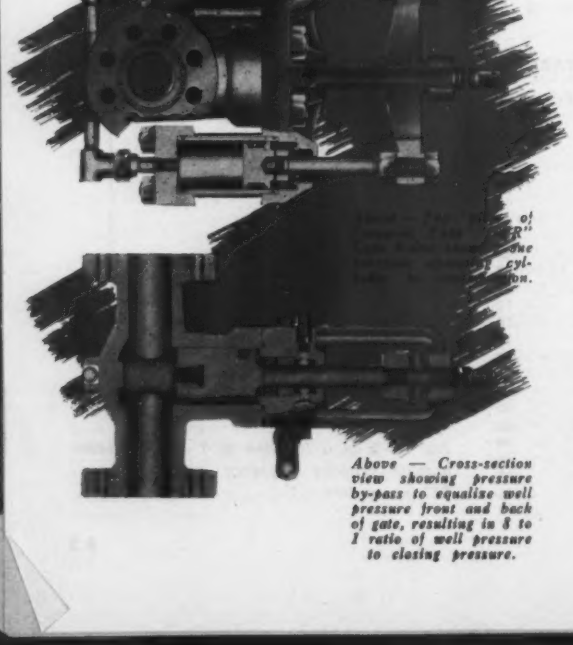

Above — Cross-section view showing pressure by-pass to equalise well pressure front and back of gate, resulting in 8 to 1 ratio of well pressure to closing pressure.

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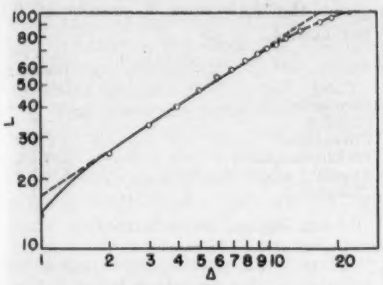


TABLE II—COMPARISON OF CONSTANTS OF THE EQUATION

$\log Y = K_y + K_Y \log c$

Class of compound—	K_y From the present data	K_y Given by Ryan	K_Y From the present data	K_Y Given by Ryan
Polysulfides	2.46	2.16	0.52	0.36
Thiols	2.39	2.03	0.52	0.36
Disulfides	2.35	2.03	0.52	0.36
Sulfides	2.22	1.90	0.52	0.36
Thiophenes	2.00	1.76	0.52	0.36

The K_y values are in the same order, though slightly different in magnitude.

Fig. 5—(Above) L as a function of Δ for 60-octane number primary reference fuel plus 3 cc. TEL per gallon

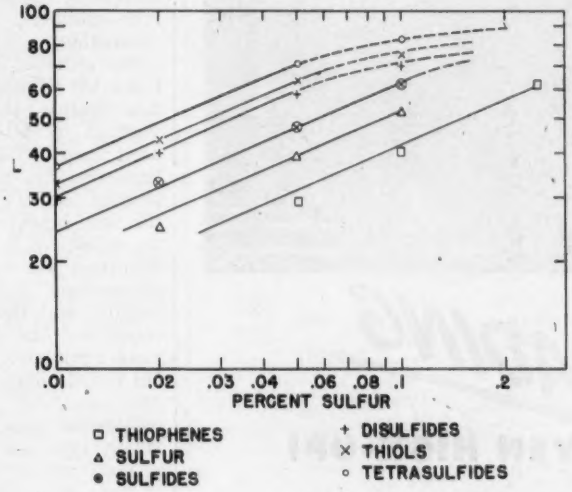


Fig. 6—(Right) Decrease in TEL efficiency (L) as a function of sulfur concentration for various classes of sulfur compounds. (Logarithmic plot)

None of these equations is valid above $\Delta = 10$ ($y = 59$; $L = 70$). The equations giving L as a function of c are not valid below $\Delta = 1.7$.

The decrease in lead efficiency (L) observed with the six principal classes of sulfur compounds is plotted as a function of sulfur concentration in Fig. 6. Ryan's octane number data for Rodessa reformed gasoline containing 3 cc. TEL per gallon and various amounts of propyl sulfide or propyl disulfide (from his Table 3) have been plotted in terms of Δ and L in Figs. 7 and 8. The equations corresponding to the straight lines are:

Propyl disulfide:

$\log \Delta = 1.09 + 0.43 \log c$
$\log L = 2.09 + 0.29 \log c$
$\log y = 2.03 + 0.36 \log c$ (Ryan)

Propyl sulfide:

$\log \Delta = 0.74 + 0.43 \log c$
$\log L = 1.80 + 0.29 \log c$
$\log y = 1.90 + 0.36 \log c$ (Ryan)

This shows that the parallel linear equations for Δ and L are not limited to the reference fuel that was used in the present investigation.

Ryan's remarkable observation that the slope of all log y-log c plots was constant (i.e., the lines are parallel) for all sulfur compounds has been verified in the present work. However, the values for the slope K_Y obtained with Rodessa gasoline is quite different from that obtained with 60-isooctane : 40-heptane blends (Table 11). Ryan's K_Y value is the smaller by 30 per cent.

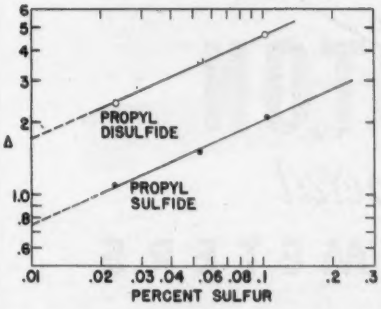


Fig. 7—Decrease in octane number as a function of sulfur concentration. Data from Ryan. (Logarithmic plot)

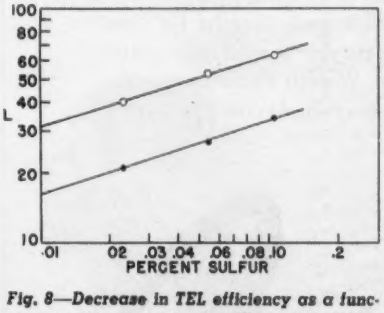


Fig. 8—Decrease in TEL efficiency as a function of sulfur concentration. Data from Ryan. (Logarithmic plot)

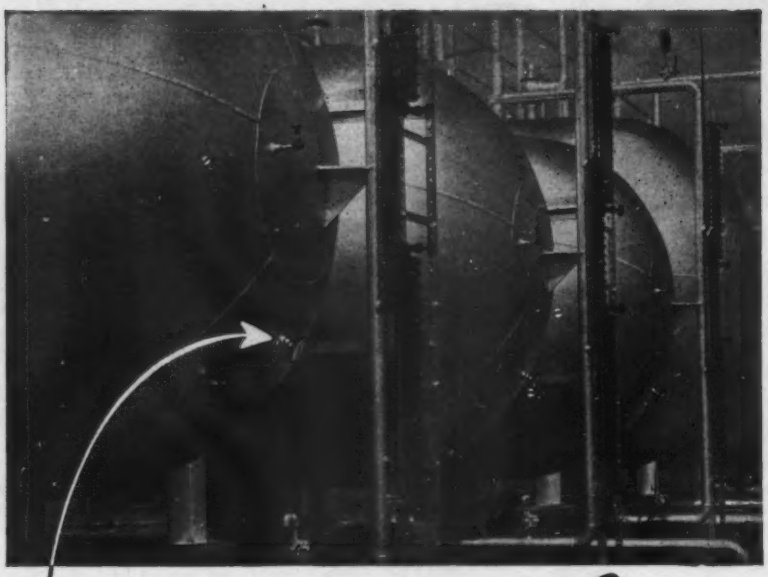
Adirovich[1] has developed a mathematical treatment of sulfur antagonism, based on the theory of chain reactions, in which K_Y is equated to a factor that is dependent on the relative preponderance of chain branching over chain breaking. According to this concept a larger value of K_Y corresponds to a decrease in the importance of chain-breaking reactions. So it may be assumed that for 60-isooctane : 40-heptane blends chain breaking is less important than in the case of Ryan's reformed gasoline. The application of chain theory to sulfur antagonism will be discussed more completely in later papers of this series.

Discussion of Results

Results obtained in the present investigation are in general agreement with those previously published. Schulze and Buell[22] state that the deleterious effect of disulfides increases with molecular weight, but their data show only a slight effect. Birch and Stansfield[6] showed different sulfides to be equivalent, and Ryan[20] concluded that all aliphatic sulfur compounds of the same class were equivalent at the same sulfur concentration.

Schulze and Buell[22] found aryl disulfides to be less deleterious than alkyl, and Bottomley[7] found a similar result for aryl sulfides. Both Schulze and Buell[22] and Ryan[20] concluded from the low result obtained with thiophene that all heterocyclic sulfur compounds had very little antagonism toward tetraethyl lead. However, Birch and Stansfield[6] found, as is also reported herein (see Tables 3 and 4), that saturated heterocyclics have the same activity as acyclic sulfides. Ryan[20] first observed the linearity of log-log plots of sulfur effect vs. sulfur concentration, which is verified by the present paper.

In discussing the results reported by other investigators in this field, it must be emphasized that, with the exception of Birch and Stansfield, the previous workers have always used some specific gasoline that was available to them only. The results obtained in any given laboratory, therefore, are not strictly comparable with those obtained in other laboratories. Birch and Stansfield used a 65-isooctane : 35-heptane blend, and therefore their results should compare closely with those reported in this paper. Extrapolation of their data to TEL concentration of 3 cc. per U. S. gallon



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Class—	Δ = decrease in Oct. No.*
Elementary S	5
Sulfides	6
Ethanethiol	8
1,2-Ethanedithiol	9.5
Primary alkyl disulfides	8 to 9
Thiophene	2

*C.F.R. engine, motor method.

These Δ values are uniformly lower than ours, the deviation being 1-2 octane numbers, or 3 in the case of ethanethiol.

The order of activity originally defined by Schulze and Buell,[25] disulfide>sulfide>thiophene, has been verified by all other workers who used the A.S.T.M. knock-out method. However, the ratings of other compounds has not always agreed with the ones reported here. For example, the statement is frequently made that disulfides are more deleterious than mercaptans. Extensive tests by Schulze and Buell[25] and Ryan[26] indicated that disulfides and mercaptans have equivalent activities. The present results show that the primary alkyl disulfides are definitely less deleterious than the mercaptans from which they are formed, at least in primary reference fuels. On the basis of tests made on ethanedithiol, Birch and Stansfield[8] concluded that dithiols were more active than monothiols. However, data for three dithiols and one trithiol (Table 2) indicate these compounds to have an effect on octane number equal to that of the monothiols.

Conclusions

The principal conclusions that can be reached from these results are:

1. At equal sulfur concentrations, all thiols have approximately the same effect on octane number.

2. Sulfides and disulfides containing aromatic rings are less antagonistic toward tetraethyl lead than the completely aliphatic sulfides and disulfides.

3. Heterocyclic sulfides, if saturated, are antagonistic to the same degree as acyclic sulfides. Unsaturated heterocyclics of the thiophene class are almost the only examples of sulfur compounds that are markedly less antagonistic than elementary sulfur.

4. Increasing the chain length of sulfur compounds in a homologous series does not alter the effect on octane number as long as all compounds are compared at the same sulfur concentration.

5. The antagonism of sulfur compounds toward tetraethyl lead, expressed in terms of decrease in octane number, lead susceptibility, or tetraethyl lead efficiency, bears a log-log relationship to the sulfur concentration over a broad range of sulfur concentrations. The different classes of sulfur compounds all increase in effect at the same exponential rate

(i.e., the log-log slope is the same), but the curves are displaced, the displacement depending on the antagonism of the particular class.

6. The order of antagonism of the most important classes of sulfur compounds in the fuel investigated and the corresponding K_1 values (compounds with higher K_1 values are more deleterious) are: alkyl tetrasulfides, 2.40; thiols, 2.35; primary alkyl disulfides, 2.32; alkyl sulfides, 2.22; elementary sulfur, 2.14; thiophenes, 2.04.

Symbols and abbreviations:

TEL = tetraethyl lead
O.N. = octane number
L = per cent loss in TEL efficiency due to the addition of a sulfur compound
y = per cent loss in lead susceptibility due to the addition of a sulfur compound
Δ = decrease in O.N. on addition of a sulfur compound
a = TEL concentration of sulfur-free fuel at the observed O.N.
c = sulfur concentration in per cent by weight
K_4, K_5 = constants of the equation relating Δ and c
K_1, K_6 = constants of the equation relating L and c
K_7, K_7 = constants of the equation relating y and c

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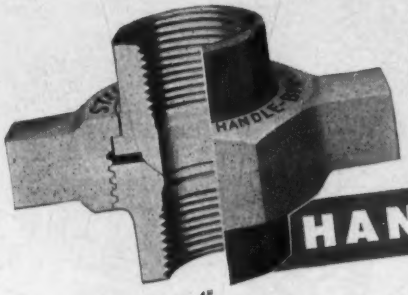

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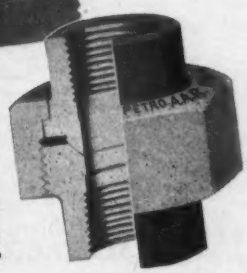
HANDLE-BAR Unions are recommended for all services. Use a hammer instead of a wrench to tighten or loosen the nut.

PETRO



This Union has features that make it the most universally used Union. It is made to A.A.R. standards with integral steel to steel seats. The seat design is a 45 degree cone, machined and cold rolled, to a ball seat on the male end. The ends and nut are extra heavy and the nut threads are permanently lubricated and rustproofed with Udylite Cadmium.

A partial list of PETRO'S proven services include pressures from a vacuum to 3000 lbs.; Temperatures from 100° below zero, F., to 1000° above zero F.; on Steam, Gas, Air, Oil, Gasoline, Ammonia, Chemicals, and all other services in which Steel or Wrought Iron Pipe is used.

Sizes 1/8" to 3"

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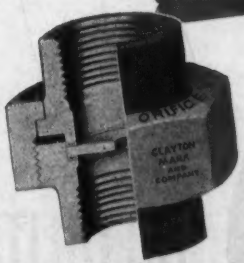

"ORIFICE" Unions, screwed, or socket weld are widely used for flow control of Steam, Oil, Ammonia, Chemicals, Water, Gas and Air. Also for metering and measuring. The ORIFICE is recommended for working pressures of 600 lbs. at 900° F., or 2000 lbs. at 150° F. Furnished with 18-8 stainless steel orifice plate and steel jacketed asbestos filled gaskets. These are set in a groove of solid steel to facilitate ease of tightening and to safeguard against possible blowing of the gaskets and resultant trouble.

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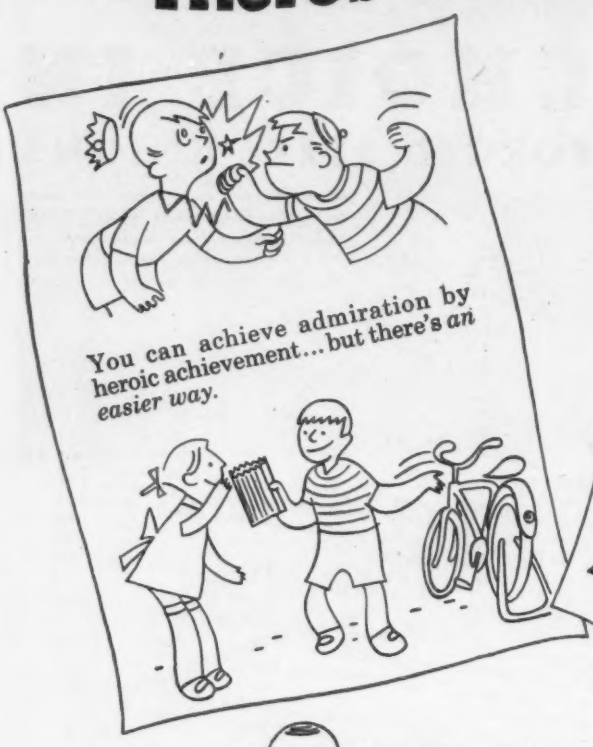

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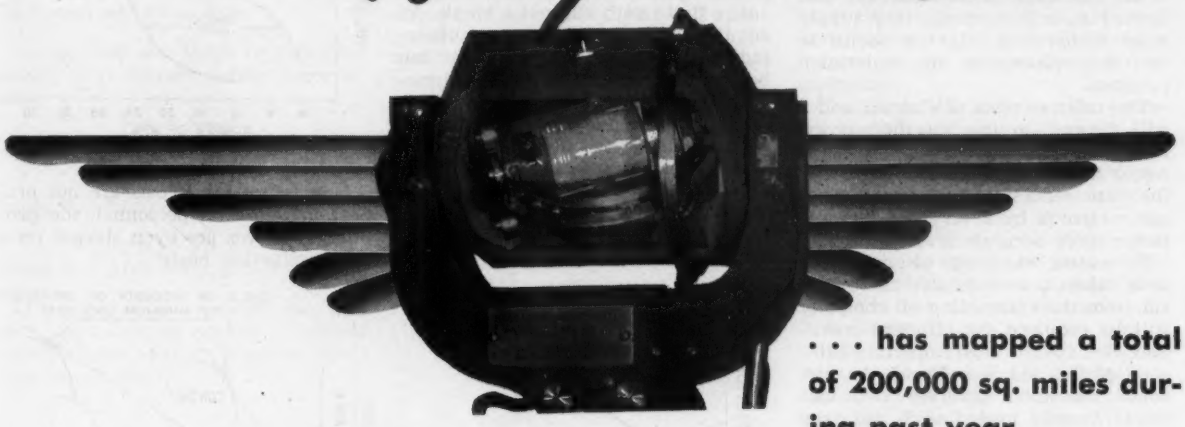


. . . has mapped a total of 200,000 sq. miles during past year

by H. Jensen

THE significant improvements in the quality of magnetic measurements brought by the airborne magnetometer promise to extend the utility of magnetic measurements well beyond previous limits. The airborne high-sensitivity instrument, which has mapped approximately 200,000 sq. miles during the past year, produces a magnetic record with these advantages:

1. High sensitivity and stability.
2. Continuity of record.
3. Escape from serious errors due to diurnal variations.
4. Freedom from near-surface accidentals.
5. High order of dependability of all parts of the record.

These advances may well move the magnetic method to a new level of usefulness in geophysical explorations, on the basis of the improved record alone.

However debatable this added utility may be, there is no conjecture in the operational impact of the new method. In one sudden change, there is speed—up to 100 or more times faster than previously possible; mobility; and almost complete freedom from terrain limitations. When the magnetometer is coupled with Shoran, the country to be surveyed need not be mapped—or even possible of mapping economically.

Until recently the magnetometer has been primarily a reconnaissance tool, because of its limitations. Today the airborne magnetometer is a reconnaissance tool because of its freedom from limitations, operationally speaking.

One example may illustrate this problem. In some jungle or bush country, complete ground surveys with the magnetometer were not justifiable, for the results were not worth the costs of cutting through the bush. Reconnaissance surveys following lines of easy travel, such as river beds, were worthless because of magnetite concentrations in the gravels of these beds. But now, with the airborne magnetometer, precise surveys of such country are just as possible as in the sectioned country of our West. And the cost is not much greater. The airborne magnetometer collects certain minimum data for the country before a single path is cut. That is true reconnaissance.

Quality of Reconnaissance

The degree of quality of this reconnaissance and the cost can be varied widely, depending on operational considerations and the extent of the survey, as required by the geological problem.

Shoran surveys of the highest positional accuracy, for example, can be conducted in any geographical location, regardless of terrain or the quality of local geodetic control. Such surveys, however, can be expensive. In some instances, cheaper and less exact studies might be better choices.

Since there is such a wide choice in operational methods, the decision concerning the type of airborne magnetometer survey can be made only when the positional techniques are evaluated as part of the whole exploration plan. Among the choices possible are these:

1. Uncontrolled reconnaissance—dead-reckoning lines flown by the aid of charts, usually inadequate, to gain only the most general knowledge of the geology, or to answer specific questions, such as the approximate limits of massive intrusions.

2. Contact traverses, based on visual reference to compiled photo indexes. Here local positioning is exact, but geodetic location depends on the ground control established. A modification of this method is the making of a photographic survey from a Shoran-guided plane. In this instance, dependable, low-order control will be extended over the whole photographed area.

3. Shoran control only, with the

ARE you considering the possibility of having some airborne magnetometer work done? Do you think you might be interested at some time in the future? This article covers many of the questions that are apt to arise in your mind. It will give you ideas about the field of usefulness of the instrument. But it will also give you basic data on the practical problems involved, and to some extent, which problems the contractor will handle, and which ones you will have to take care of. The author is chief, Magnetometer Division, Aero Service Corp., Philadelphia.

plane guided and its position recorded during the magnetic survey through continuous Shoran fixes. This was the method employed in the Bahamas survey.

Case 1 is, of course, the cheapest, but the magnetic map is all that comes of it. The more precise surveys cost more, but, as byproducts, they supply maps which will later be useful to all other phases of an exploration program.

The relative costs of Cases 2 and 3 will depend on the specific survey. In general, the flight operation is less costly in visual reference flight, but the data reduction from direct Shoran control is by a very considerable factor more accurate and less costly.

No matter what type of program is undertaken, a considerable amount of aid from the contracting oil company will be required for efficient operation. Perhaps the most important category of this aid is political. An airborne operation involves two elements heavily loaded with red tape which the oil company can help cut. First, permission to operate an airplane in a foreign country is difficult to secure, and once secured, to get expressed in actual detail. Second, radio and Shoran frequencies have to be arranged—and in some countries that is a matter normally requiring months.

Operationally, the air survey stands on its own feet. It is based at an airport, and all details are the responsibility of the surveyor, though practical help from the oil company in getting housing, gas, and supplies, will speed the survey.

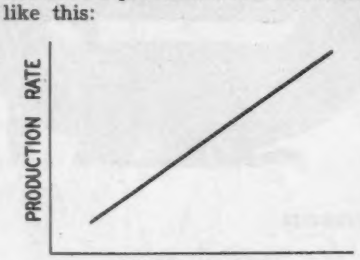
The oil company will probably assign a geologist or a geophysicist to follow the progress of a survey, and to change it as indicated by the information as it develops. However, air surveys will, in general, be conducted on a cost-per-mile basis, and the nature of the oil company-surveyor relation will be quite different from that obtaining in contract party work. The oil representative will concern himself not with production, but with analysis of results and modifications of the general survey plans. Furthermore, most airborne magnetometer contractors confine their activities to the straight-forward one of data taking and map making with no excursion into interpretation.

The circumstances of the Bahamas survey,* where a number of companies contracted for a regional survey, will probably be repeated because of the regional utility of the magnetic survey. The more extended the contiguous mapped area, the more useful is the data of any particular small area. There are two ways of conducting such joint surveys: (1) Let all act as coequals, through a committee (as in the Bahamas), or (2) let one company contract for the survey, and sell the information to other interested parties.

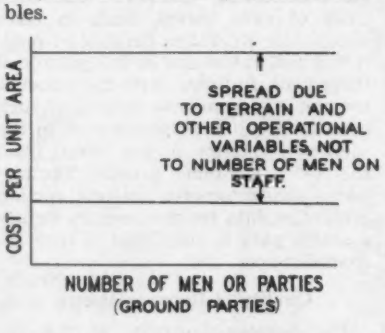
*See "Modern Exploratory Tools Being Used in Five-Company Bahama Oil Search," by Warren W. Burns, The Oil and Gas Journal, November 8, 1947.

In all types of surveys, Aero records the path of the airplane through continuous strip photographs which permit accurate reconstruction of the entire flight path without a break. An advantage here is that maps or photoindices compiled after the flight can be used to improve the positional record at any later date.

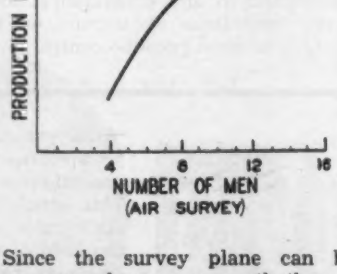
Let us examine the questions of cost, productivity and efficiency of aerial surveys, with the aid of some charts showing idealized relations of these variables. Ground survey parties have a productive rate something like this:



Simply double the number of parties, and the rate of production doubles.

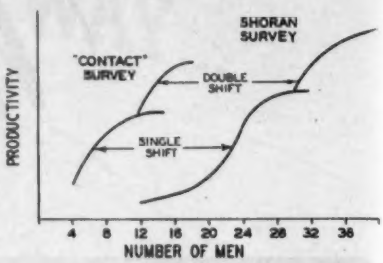

SPREAD DUE TO TERRAIN AND OTHER OPERATIONAL VARIABLES, NOT TO NUMBER OF MEN ON STAFF.
COST PER UNIT AREA
NUMBER OF MEN OR PARTIES
(GROUND PARTIES)

Air surveys, however, are operated as single units, and the effect of added personnel is to change the intensity of operations of the unit.

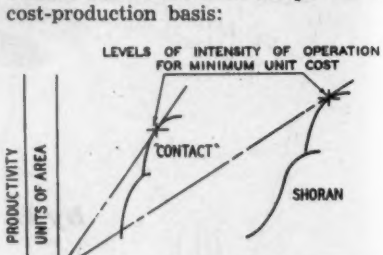


Since the survey plane can be flown more hours per month than is possible with a single crew, the curve will have a break when enough men are added to permit two shifts of flying.

Shoran necessarily adds ground station operators and more flight personnel, giving these curves:



Now, since total costs are not proportional to total personnel, the production curves are even steeper on a cost-production basis:



Time can be canceled from both coordinates in the above chart, giving cost per unit on these same curves.

It is the job of the survey planner to determine just what number of men and what intensity of operations will produce the lowest unit cost for any specific survey. Such estimates need a solid background of operations over all sorts of terrain, with several types of planes, to be more than just a good guess. It is interesting to see from these curves that it is far more expensive to understaff or to operate at too low an intensity than to overstaff or overpush.

This leads us directly to the problem of choosing the right survey plane for the job. A simple expression for the efficiency of a survey operation is this:

$$\text{Efficiency} = \frac{\text{Miles of flying in survey area}}{\text{total range of plane}}$$

$$= \frac{\text{Total range—round trip to survey area}}{\text{total range}}$$

or

$$e = 1 - \frac{2d}{R}$$

where

d = distance of survey area from base

R = net range of airplane

(Continued on page 95)

Costs then, will be inversely proportional to efficiency:

$$C = \frac{KR}{R - 2d}$$

where
C = cost per survey mile
K = cost per plane mile

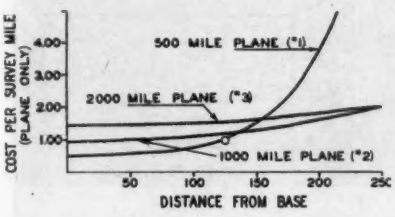
Let us consider three hypothetical planes, with characteristics listed below:

Plane No. 1
Range R_1 = 500 miles K_1 = \$.75/mile

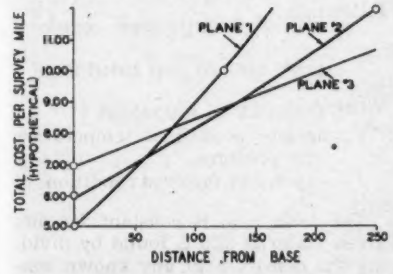
Plane No. 2
Range R_2 = 1,000 miles K_2 = \$1.00/mile

Plane No. 3
Range R_3 = 2,000 miles K_3 = \$1.50/mile

If plane operations were the sole cost, the following curves of cost of survey mile against distance from base would obtain:



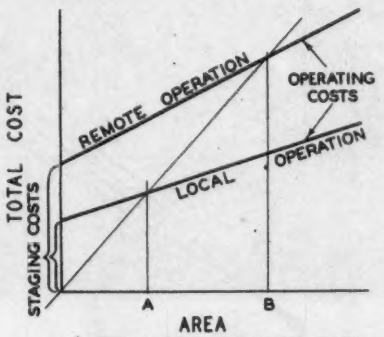
However, the actual cost of plane operation is only one of the costs involved in a survey, so the total cost per plane mile more nearly approaches a constant. Hence, the economical advantage of a long-range plane becomes even more pronounced, though its cost per plane mile may be higher.



To permit the most efficient matching of airplane to survey problem, Aero uses three standard aircraft of widely different characteristics: the AT-11 Beechcraft for short-range work; the DC-3 for long-range work from a good base; and the PBY for jungle and bush. It should be noted that the efficiency formula is highly simplified in omitting a factor for plane dependability, and hence it fails to give strong enough evidence of the advantage of a plane of great dependability such as the DC-3. In Nassau, for example, the DC-3 operated for 60 consecutive days.

Now let us consider costs as a function of area and distance from staging base. The costs of a survey readily break down into two principal categories—one of them a constant for a given survey, the other a direct function of time or production. In the first category will be the expenses that occur only once: the staging and transportation costs, licenses, special device development, and so on. These costs will be roughly a direct function of distance from the staging base.

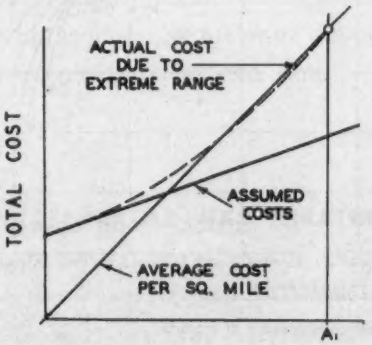
The other set of costs will be the continuing ones, such as wages, gasoline, and depreciation. These will increase with remoteness of survey area from the staging base, but by no means directly. The relations are illustrated below:



(NOTE: COSTS ARE EQUAL FOR LOCAL AREA A, OR REMOTE AREA B)

It is evident that the cost per mile for a given area will be greater for a remote survey than for a local one, but that a sufficiently large survey at a remote place may have a unit cost equal to that of a small one located near the staging base.

This consideration will determine the limiting small size of an area to be surveyed economically. However, it does not necessarily follow that a large area can be surveyed more economically than a small one. If, as was the case in the Bahamas, a very large area must be surveyed from a single base, then a surprisingly great part of the total effort is spent in geodetic positioning and in dead travel. As a result, the efficiency falls off and the curve of costs is affected.



If Shoran is used an identical number of stations must be set up, regardless of the separation of flight lines. However, if the survey area is to be flown by visual reference, complete maps must be made. Therefore, it is not so economical a procedure as it may at first seem to space the flight lines more widely. Magnetic control lines, moreover, must be made in a pattern almost independent of this separation.

Though in the Bahamas the learning of new techniques caused us to fall behind in our data schedules, we proved there that with Shoran flight guidance it is possible to make preliminary maps of high accuracy very soon after flying an area. Aero's data staff in Philadelphia now produces, as a matter of routine, more than 1,000 sq. miles per day of contour maps from Shoran flying, besides a considerable amount of the slower reduction from "contact" surveys. This is a higher rate of production than a field crew can sustain, and hence it indicates that we can hereafter follow field work with finished maps in a matter of days. It is only with Shoran, however, that such a schedule is possible.

Companies without previous experience in geophysics have done nearly all the commercial work with the airborne magnetometer. The reason is that the problems involved are essentially flying problems and mapping problems. The Gulf instrument has proved accurate and dependable. Its operation is straightforward and predictable.

The operational problems, on the other hand, are complex in the extreme, and the data-reduction techniques are related more to considerations of mapping than to those of geomagnetics. Magneto control itself has been reduced to a geometric problem of flight patterns.

Hence it is no accident that companies new to geophysics have achieved prominence in this new activity. They have done so because their background of experience fitted them best for the use of this remarkable new device. As a result, the data from the airborne magnetometer is presented by the surveying companies as fact and not opinion.

Construction Is Started On New Chemicals Plant

HOUSTON.—Construction work is now under way on a new unit of the Grasselli Chemicals Division of E. I. de Pont de Nemours & Co. on the south side of the Houston Ship Channel near La Porte, Tex.

The plant, to cost about \$1,000,000, will manufacture a new insecticide, benzene hexachloride. Production of the insecticide was started about 2 years ago in a pilot plant in the Houston area.

Effect of Temperature and Pressure on Specific Gravity

by Pierce M. Reynolds

AN excellent method of determining the effect of temperature and pressure on the volume or density of liquids has been presented by K. W. Watson and associates of University of Wisconsin, but the method involves complicated factors and concepts that are not widely known. The following is an attempt to apply his methods to certain simple cases and to make the process more directly useful to petroleum refiners and equipment manufacturers. The author is a student at University of Tulsa, and this paper is a special study conducted under the direction of Prof. W. L. Nelson.

THE compressibility of liquids under high pressures and temperatures is sometimes neglected—in fact, many engineers appear to be unaware of the effect of temperature and pressure. Near the critical temperature, pressure causes significant change in the volume of liquids. At temperatures for gasolines of 350° F. and for lube oils of 800° F., the change in specific gravity due to pressure becomes considerable.

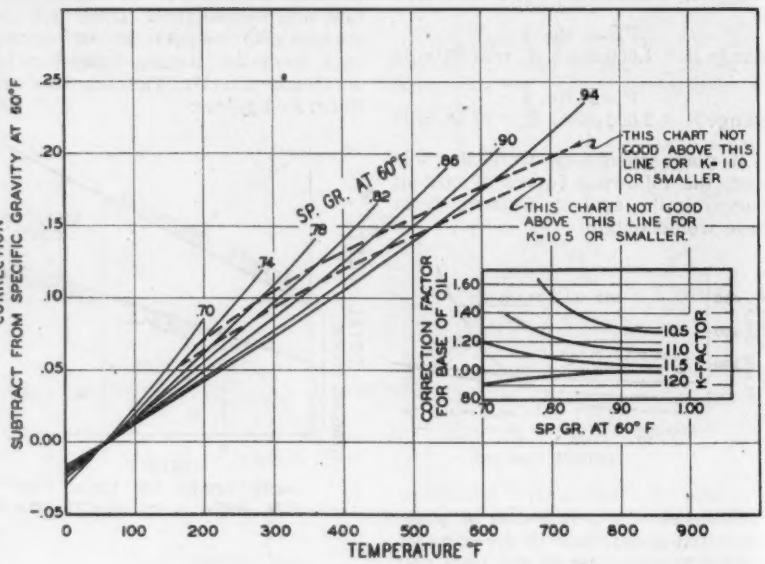


Fig. 2—Change of specific gravity of petroleum oils

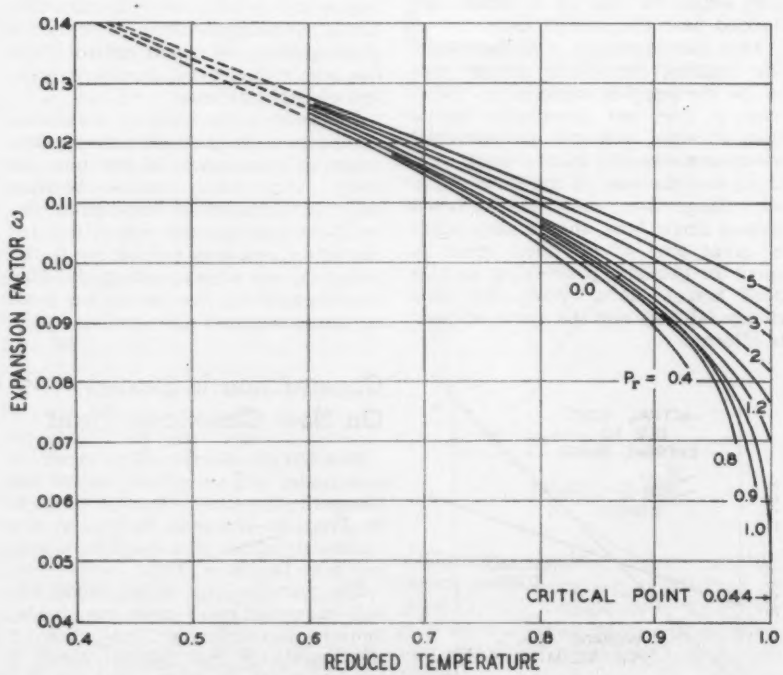


Fig. 1—Thermal expansion and compression of liquids

Watson[1] has shown that the compressibility and thermal expansion properties of a number of liquids under study may be represented by the following:

$$\rho = \frac{\rho_1}{\omega_1}\,\omega \qquad (1)$$

Where

ρ = density at desired temperature and pressure

ω = expansion factor at conditions of

The term ρ_1/ω_1 is constant for any given material and is found by dividing the density ρ_1 at any known conditions by an expansion factor ω_1 at the same conditions as ρ_1.

The expansion factor ω was related to reduced temperature and reduced pressure by Hougen and Watson[2] as shown in Fig. 1. For pressures below 10 atm. (147 psia.) and reduced temperatures of 0.65 or below, the following equation may be used to find ω:

$$\omega = 0.1745 - 0.0838\ \mathrm{Tr} \qquad (2)$$

Where

ω = expansion factor

Tr = reduced temperature (absolute temperature divided by absolute critical temperature)

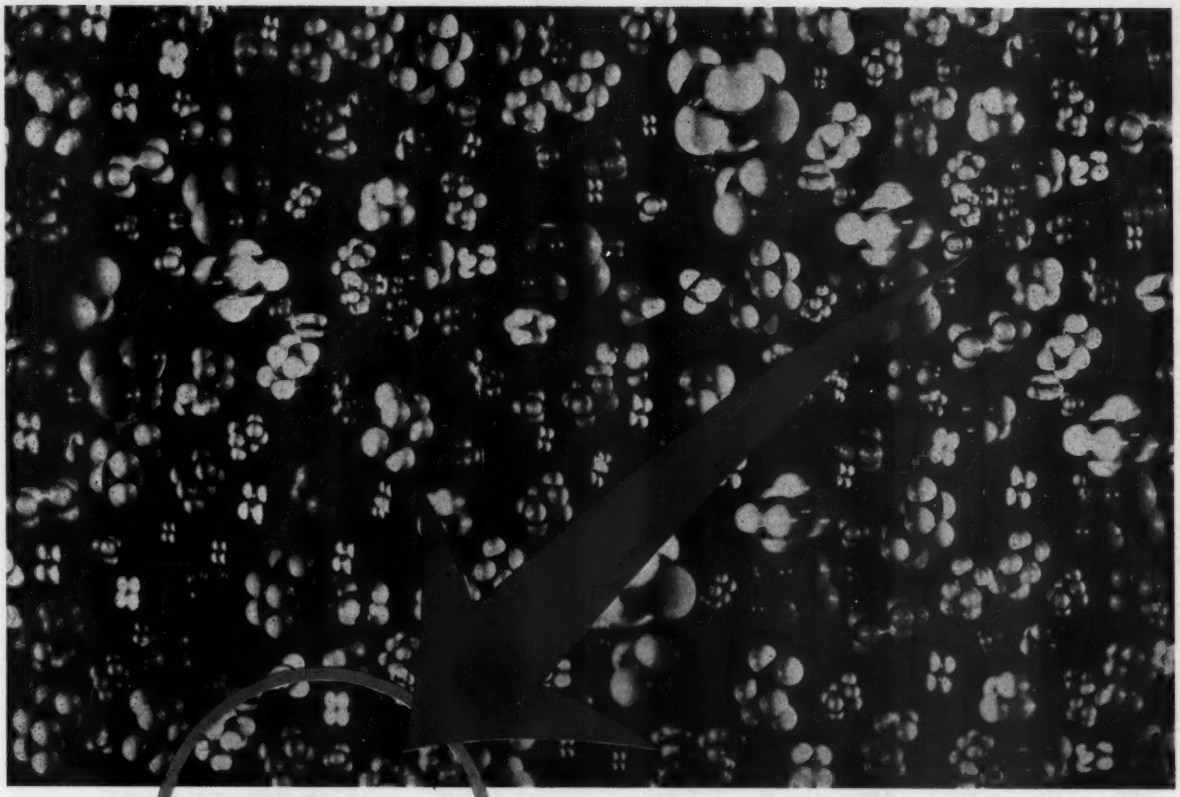


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TABLE 1—VALUES OF ρ_1/ω_1 FOR PETROLEUM OILS

A.P.I. gr. at 60° F.	Sp. gr. at 60° F.	K = 10.0	K = 10.5	K = 11.0	K = 11.5	K = 11.8	K = 12.0	K = 12.5
86.2	0.65	....	....	....	....	....	....	5.32
82.9	0.66	....	....	....	....	....	....	5.33
79.7	0.67	....	....	....	....	....	....	5.34
76.6	0.68	....	....	....	....	....	5.51	5.35
73.6	0.69	....	....	....	....	....	5.53	5.37
70.6	0.70	....	....	....	....	5.62	5.54	5.38
67.8	0.71	....	....	....	5.74	5.63	5.56	5.41
65.0	0.72	....	....	....	5.76	5.64	5.58	5.43
62.3	0.73	....	....	....	5.77	5.67	5.60	5.46
59.7	0.74	....	....	....	5.78	5.68	5.62	5.48
57.2	0.75	....	....	6.00	5.81	5.70	5.64	5.52
54.7	0.76	....	....	6.01	5.82	5.73	5.67	5.54
52.3	0.77	....	....	6.02	5.84	5.76	5.70	5.58
49.9	0.78	....	....	6.03	5.87	5.78	5.73	5.62
47.6	0.79	....	6.26	6.05	5.89	5.82	5.76	5.64
45.4	0.80	....	6.27	6.07	5.92	5.84	5.79	5.68
43.2	0.81	....	6.28	6.09	5.94	5.87	5.82	5.73
41.1	0.82	....	6.29	6.12	5.97	5.90	5.86	5.77
39.0	0.83	....	6.31	6.14	6.00	5.93	5.89	5.81
37.0	0.84	6.55	6.33	6.17	6.03	5.97	5.93	5.84
35.0	0.85	6.56	6.36	6.10	6.07	6.00	5.97	5.88
33.0	0.86	6.57	6.38	6.23	6.11	6.03	6.00	5.92
31.1	0.87	6.58	6.41	6.26	6.14	6.08	6.04	5.96
29.0	0.88	6.59	6.43	6.30	6.18	6.12	6.08	6.00
27.5	0.89	6.61	6.47	6.33	6.22	6.16	6.13	6.04
25.7	0.90	6.63	6.49	6.37	6.26	6.19	6.17	....
24.0	0.91	6.66	6.53	6.40	6.29	6.23	6.21	....
22.3	0.92	6.69	6.57	6.44	6.33	6.28	6.24	....
20.6	0.93	6.72	6.60	6.48	6.38	6.32	....	....
19.0	0.94	6.74	6.63	6.51	6.42	6.37	....	....
17.4	0.95	6.78	6.67	6.54	6.46	....	....	....
15.9	0.96	6.81	6.71	6.58	6.50	....	....	....
14.4	0.97	6.84	6.74	6.62	....	....	....	....
12.9	0.98	6.88	6.78	6.66	....	....	....	....
11.4	0.99	6.92	6.82	6.70	....	....	....	....
10.0	1.00	6.96	6.85	6.74	....	....	....	....
8.6	1.01	6.99	6.89	....	....	....	....	....
7.2	1.02	7.03	6.93	....	....	....	....	....
5.9	1.03	7.08	6.97	....	....	....	....	....
4.6	1.04	7.12	7.02	....	....	....	....	....
3.3	1.05	7.16	....	....	....	....	....	....
2.0	1.06	7.21	....	....	....	....	....	....
1.7	1.07	7.24	....	....	....	....	....	....
—0.5	1.08	7.29	....	....	....	....	....	....

TABLE 2—CHARACTERIZATION FACTORS OF MISCELLANEOUS STOCKS

Stock—	A.P.I. gravity	Characterization factor
Bradford, Pa.	44.7	12.1-12.5
Oklahoma City	36.6	11.9-12.2
East Texas crude oil	40.8	11.9
Mount Pleasant, Mich., crude oil	43.3	12.0
Muskegon, Mich., crude oil	38.2	11.6
Kettleman Hills, Calif., crude oil	34.5	11.4
Signal Hill, Calif., crude oil	29.6	11.1
Venice, Calif., crude oil	22.5	10.9
Huntington Beach, Calif., crude oil	13.3	10.8
Kettleman Hills, Calif.	37.5	†11.6-11.9
Long Beach, Calif.	25.1	†11.5-11.7
Santa Maria, Calif.	16.9	†11.5-11.9
Midway, Calif.	22.0	†11.2-11.6
McKittrick, Calif.	15.0	†11.0-11.5
Raw absorption gasoline	94.6	13.6
Natural gasoline, Kettleman Hills	81.9	12.7
Natural gasoline, Mid-Continent	82.2	12.8
Distillates from residues in cracking M.-C. gas oil	12.6-21.4	*10.25-10.7
Distillates from residues in cracking M.-C. gas oil	2.1-8.7	*9.9-10.3
Catalytic cracked naphtha, 300°-400° F.	35.9	11.1
Mid-Continent distillates	24.9-47.2	*11.8-12.2
Smackover, Ark., distillates	21.0-33.1	*11.35-11.5
Pennsylvania distillates	31.0-43.4	*12.1-12.5
Pressure gas oil, paraffinic charge	32.0	11.8
Pressure gas oil, naphthenic charge	26.0	11.2
Light-cycle gas oil	20.0	10.5
Heavy-cycle gas oil	11.0-14.0	10.4-10.5
Pennsylvania lube oil	28.0-30.3	*12.3-12.5
Bright stock, California	18.8	11.7
Cracked residuum	2.6-10.3	*10.5-10.7
Cracked residuum	—4.3	9.5
Liquid paraffin hydrocarbons	....	12.7
Hexane	81.1	12.8
Octane	68.8	12.7
Benzene	....	9.8

*Cauley and Delgass, The Oil and Gas Journal, July 27, 1946, p. 166. †Mithoff, MacPherson and Sipes, The Oil and Gas Journal, November 6, 1941, p. 81.

Therefore, with the use of Fig. 1, a known value of density, and critical temperature and critical pressure data, the density at any desired temperature and pressure may be calculated by means of Equation 1.

The use of Equation 1 is greatly simplified when ρ_1/ω_1 for the material under consideration is known. Table 1 gives the values of ρ_1/ω_1 that have been computed for petroleum oils ranging according to characterization factor from a specific gravity of 0.65 to 1.08.

The characterization factor[3] is an index to the base or kind of oil under consideration. Technically, it is defined as the cube root of the boiling point (°F. abs.) divided by the specific gravity at 60° F. Characterization factors for some stocks commonly encountered are given in Table 2.

Example 1.—Given an oil of A.P.I. gravity at 60° F. = 30.2 and K = 10.5, find the specific gravity at 600° F. and 1,700 psia.

Solution:

$$\rho = \frac{\rho_1}{\omega_1}\,\omega$$

1. Sp. gr. at 60° F. = 0.875
   then ρ_1/ω_1 = 6.42 (from Table 1)
2. T = 600° F. = 1,060° R.
   Tc = 690° F. = 1,050° R. (critical temperature)
   then $Tr = \frac{1{,}060}{1{,}150} = 0.922$ (reduced temperature)
   P = 1,700 psia.
   Pc = 530 psia. (critical pressure)
   then $Pr = \frac{1{,}700}{530} = 3.21$ (reduced pressure)
   then ω = 0.0983 (from Fig. 1)
3. Thus:

ρ = (6.42) (0.0983) = 0.631 at 600° F., 1,700 psia.

Example 2.—Given an oil of A.P.I. gravity at 60° F. = 39.0 and K = 11.0, find the specific gravity at 320° F. and 140 psia.

Solution:

$$\rho = \frac{\rho_1}{\omega_1}\,\omega$$

1. Sp. gr. at 60° F. = 0.830
   then ρ_1/ω_1 = 6.14 (from Table 1)
2. T = 320° F. = 780° R.
   Tc = 655° F. = 1,115° R.
   then $Tr = \frac{780}{1{,}115} = 0.700$

(Continued on page 102)

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Wells Hall, petroleum-engineering building

SALIENT FACTS AND FIGURES

General.—Located at Socorro, 75 miles south of Albuquerque. Established by territorial legislature in 1889. The Bureau of Mines and Mineral Resources was established on the campus in 1927 and the Research and Development Division at Albuquerque in 1946. The latter division conducts fundamental industrial and military research.

Curriculum.—Emphasizes: (1) strong foundations in the basic sciences integrated with work in advanced professional courses and combined with supervised and directed field work and practical experience; (2) the development of facility with written and oral expression; (3) understanding human behavior, and modern social, economic and political relationships.

Buildings and grounds.—Main campus, approximately 100 acres. In addition the School of Mines owns federally granted lands throughout the state totaling 200,000 acres. The campus plant facilities include Wells Hall (petroleum engineering building), 10 additional permanent buildings, 3 of which are dormitories for single students, and housing units for married students and their families.

Expenses.—Tuition per semester: residents $30; nonresidents $125. Board, room, and fees, average minimum per semester, $250.

Calendar.—Two regular (fall and spring) semesters; 6 weeks geology field camp, 4 weeks surveying, and 13 weeks summer session running concurrently.

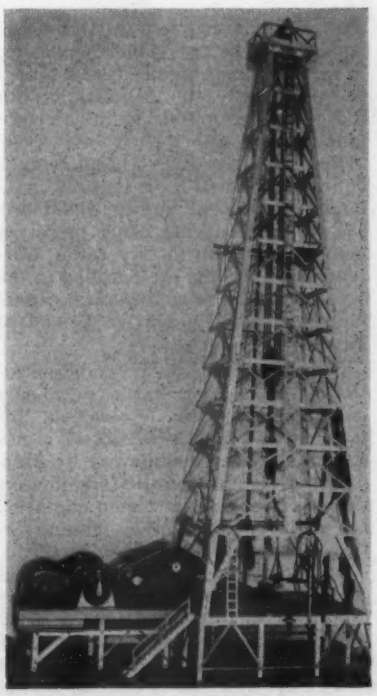
E. J. Workman, president and research director

Georges Vorbe, head of geology department

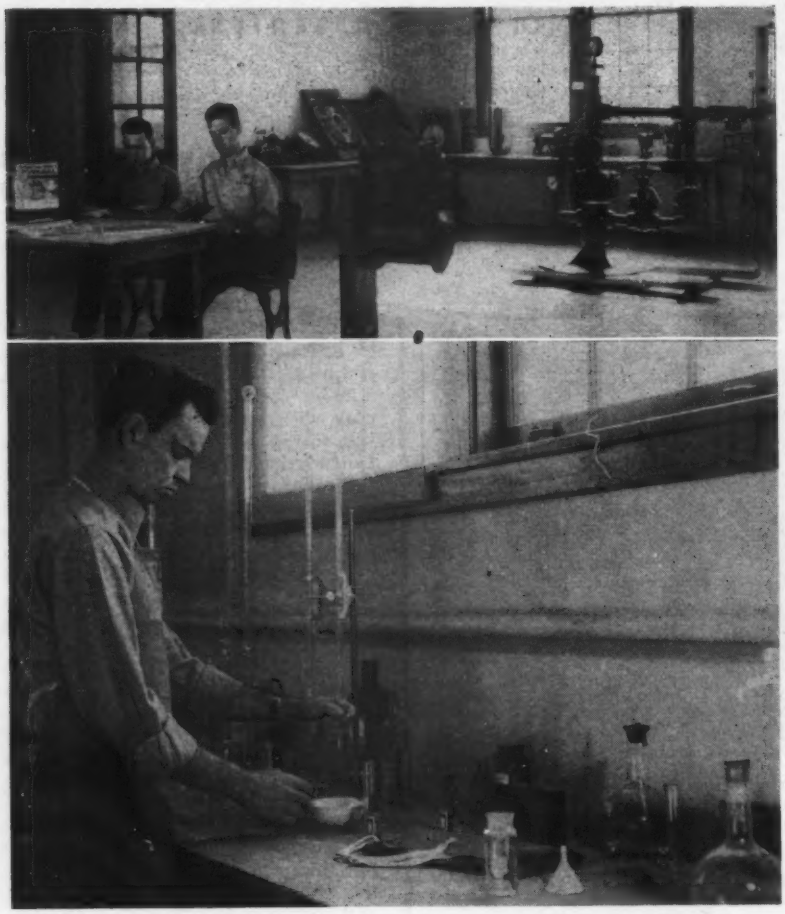
C. B. Folsom, Jr., assistant professor

THE New Mexico School of Mines has a highly strategic location for technical training relating to the mineral industries. This is true not only with regard to further exploration for oil and gas resources and petroleum production engineering, but for mining and related industrial fields as well. The school is located about midway between the large southeastern petroleum production area centering around Hobbs and the oil and gas fields of the San Juan basin district in the northwestern part of the state. In addition, active geological and geophysical exploration and exploratory drilling are being performed in widespread areas throughout the state.

The curriculum places initial emphasis on strong foundations in the basic sciences: mathematics, chemistry, physics, geology, and fundamental engineering subjects. Also, it is felt that a primary requisite to effective professional work in engineering and science is facility with both written and oral expression. Required



Operating scale model of rotary rig at New Mexico Mines



View at top of page is of a portion of the petroleum-engineering museum and reading room. Immediately above is a view of the water-treating laboratory

and elective courses in the social studies are being further developed in recognition of the need for a broader pattern of general education for those who are preparing to enter engineering.

New Mexico Mines is following a policy which will limit its total maximum enrollment to approximately 325 to 350 students. This preserves favorable student-faculty ratio. Currently, 40 students are enrolled in the 4-year petroleum-engineering curriculum at the New Mexico School of Mines.

Clarence B. Folsom, Jr., and Georges Vorbe are counsellors in petroleum engineering. Folsom received his training at Colorado School of Mines and was formerly employed by Phillips Petroleum Co. He administers the affairs of the petroleum engineering department. Vorbe, administrative head of the geology department, is well known as a consulting and oil company geologist in the Mid-Continent area.

Dr. William G. Camp is director of instruction for the School of Mines and E. C. Anderson is director of the State Bureau of Mines and Mineral Resources. The latter-mentioned bureau was established as a department of the school in 1927 for the purpose of assisting in the further development of the mineral industries of the state. An important part of the work of the Bureau of Mines deals with the petroleum geology of the state and with oil and natural-gas production and refining.

Temperature, Pressure Of Specific Gravity

(Continued from page 98)

P = 140 psia.
Pc = 440 psia.

$$\text{then } Pr = \frac{140}{440} = 0.318$$

then $\omega = 0.115$ (from Fig. 1)

3. Thus:

$\rho = (6.14)\ (0.115) = 0.706$ at 320° F., 140 psia.

Kind of Material

Heretofore, charts have been prepared correlating specific gravity and temperature without considering the effect of characterization factor and pressure (e.g., Fig. 43, W. L. Nelson, Petroleum Refinery Engineering). Obviously these charts are in error, particularly in the high-temperature ranges.

In the region of Fig. 1 in which pressure has only a very small effect on ω, the specific gravity of petroleum oils may be corrected for temperature and characterization factor by means of Fig. 2. Below a reduced temperature of 0.65 the effect of pressure on specific gravity is small. This graph is based on oils with characterization factors of 11.8 and corrections must be applied for oils and other characterization factors.

The graph in Fig. 2 is satisfactory for pressures up to 10 atm. With respect to temperature, the chart has several limits depending upon the characterization factor, or kind of stock, as indicated in Fig. 2. Thus, the graph should not be used above the lower dotted line for materials with characterization factors of 10.5 or lower, and should not be used above the upper dotted line for materials with characterization factors of 11.0 or lower. The graph is good all the way to the end of the curves for materials having characterization factors of 11.8 and higher. It is especially useful when low temperatures are encountered such as in metering and pumping.

Example 3.—Given an oil of A.P.I. gravity at 60° F. = 25.0 and K = 11.8, find the specific gravity at 400° F. and 100 psia.

Solution:

Sp. gr. at 60° F. = 0.904

Correction to be subtracted = 0.111 (Fig. 2)
Correction factor for base of oil = 1.00 (Fig. 2)

then specific gravity = 0.904 — (1.00) (0.111) = 0.793 at 400° F., 100 psia.

Example 4.—Given an oil of A.P.I. gravity at 60° F. = 39.0 and K = 11.0, find the specific gravity at 320° F. and 140 psia.

Solution:

Sp. gr. at 60° F. = 0.830

Correction to be subtracted = 0.101 (Fig. 2)
Correction factor for base of oil = 1.20 (Fig. 2)

then specific gravity = 0.830 — (1.20) (0.101) = 0.709 at 320° F., 140 psia.

References

1. Watson, K. M., Ind. Eng. Chem. 35:398 (1934).
2. Hougen, O. A.; Watson, K. M., Chemical Process Principles, Part 2, John Wiley & Sons, Inc., New York (1947).
3. Nelson, W. L., Petroleum Refinery Engineering, McGraw-Hill Book Co. (1941).

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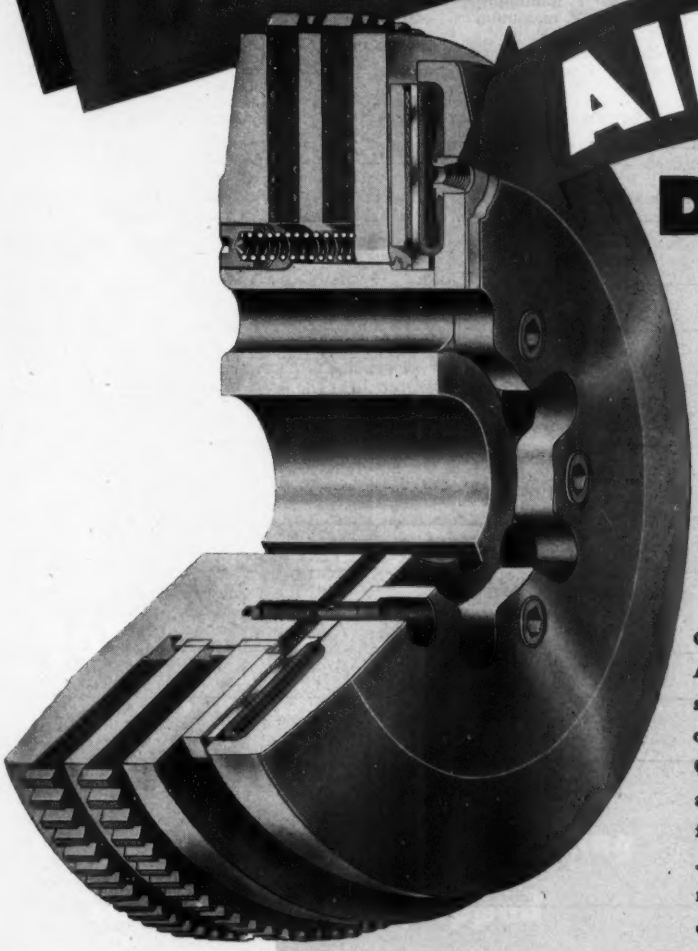

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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

Truck Lubricants

What are the kinds of lubricants used in trucks at different temperatures, particularly for the rear axle.—D. F. P.

The recommendations of D. T. Stanton of the Dodge Division of the Chrysler Corp. are shown in Table 1. The several S.A.E. grades referred to in Table 1 differ from one another mainly with regard to viscosity. Table 2 shows the viscosity and pour-point ranges of the S.A.E. grades. The letters e.p. used in Table 1 refer to extreme-pressure lubricants. These contain an additive material which is mildly corrosive under operating conditions, and they enable the gears to carry loads enormously larger than those carried by regular lubricants.

TABLE 2—S.A.E. GRADES OF LUBRICANTS

S.A.E.	Saybolt Universal vis.	Special pour point
75	75 at 100° F. maximum	—50
	100 at —50° F. minimum	
80	100 at zero °F. maximum ..	—20
90	80-1,500 at 100° F.	0
140	120-200 at 210° F.	35
250	200 at 210° F. minimum	..

Cetane Number of West Texas Diesel Fuel

Can you direct us to information on the cetane number of West Texas distillate?—F. A. R.

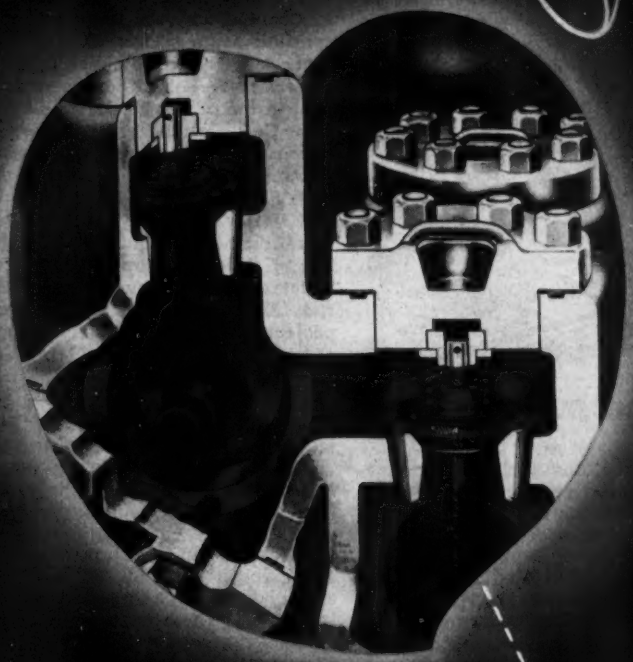
Bogan and Wilson in their paper, "Ignition Accelerators for Compression-Ignition Engine Fuels" (Pet. Refiner, July 1944) show cetane numbers of 45, 48, and 64 for three West Texas distillates. Such a range is to be expected because the boiling range greatly affects the cetane number *(see The Refiner's Notebook No. 72, Evaluation of Diesel Fuels, The Oil and Gas Journal, December 15, 1945, p. 127).*

TABLE 1—RECOMMENDED TRUCK LUBRICANTS

		Truck parts and their proper lubricants				
		Transmission		Rear axles		
Atm. temp., (°F.)	Engine oil	Three-speed	Four and five-speed	Hypoid gears	Spiral bevel and double reduction	Two-speed
Below —10	No. 10-W plus 10% kerosine	(See Note 1 below)	(See Notes 1 and 2 below).	(See Notes 3 and 4 below).	(See Note 3 below).	(See Note 5 below).
As low as —10	No. 10-W					
Below zero		S.A.E. 80 gear lubricant, or S.A.E. 90 gear lubricant plus 20 per cent No. 10-W engine oil.	S.A.E. 80 e.p. mild or S.A.E. 90 e.p. mild gear lubricant plus 20 per cent No. 10-W engine oil.	S.A.E. 80 (truck-duty type) for extended periods of these low temperatures.	S.A.E. 80 e.p. mild or S.A.E. 90 e.p. mild gear lubricant plus 20 per cent No. 10-W engine oil.	
Above zero				S.A.E. 90 truck-duty hypoid lubricant (inactive type).		
As low as 10	No. 20-W					
Zero to 32		S.A.E. 90 low-cold-test gear lubricant.	S.A.E. 90 mild or low-cold-test gear lubricant.		S.A.E. 90 e.p. mild low-cold-test gear lubricant.	
As low as 32	S.A.E. 30					
Above 32		S.A.E. 140 gear lubricant.	S.A.E. 140 e.p. mild gear lubricant.		S.A.E. 140 e.p. mild gear lubricant.	
Not lower than 90	S.A.E. 40					
Up to 100						S.A.E. 90 e.p. mild or truck-duty lubricant
Above 100						S.A.E. 140 e.p. mild or truck-duty lubricant

NOTES

1. Three and four-speed transmissions should be drained and refilled every 15,000 miles and seasonally, as indicated on chart above.
2. Five-speed transmissions should be lubricated every 10,000 miles and seasonally.
3. Rear axles should be drained, flushed with flushing oil, and refilled every 15,000 miles in accordance with chart.
4. Truck hypoid axles require an inactive type of hypoid lubricant which is different from the active type used in passenger-car hypoid axles. A simple test for the proper lubricant is this: Place a polished strip of copper in the hypoid lubricant for about 30 minutes at normal room temperature. If the copper turns black and becomes coated with a black substance, the lubricant is of the active type. If the lubricant is inactive, the copper strip may become slightly discolored, but it will not be covered with a black substance. Truck-duty hypoid lubricant (inactive type) is satisfactory for use in passenger-car hypoid axles, but hypoid lubricant (active type) should not be used in truck hypoid axles.
5. Two-speed rear axles should be drained, flushed with flushing oil (not kerosine), and refilled every 15,000 miles. The axle should be filled until the lubricant overflows from the overflow plug hole. This filling requires about 7½ qt. or 15 lb. of lubricant. After filling, insert plug and add about 1 pt. of lubricant, using filler hole at top of carrier to supply this extra lubricant required to fill the differential and planetary unit. Do not overfill.



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GAS cycling has grown in stature since its inception to become an important production process. Its successful application requires the evaluation of numerous complex engineering data as well as a rounded business knowledge of gas and gas-products economics. It is the purpose of this article and another to follow immediately, by the same authors, to consider some of the more practical aspects of this multiphase operation.

Martin G. Miller has been associated in the past with Stanolind Oil & Gas Co., Cotton Valley Operators Committee, Haynesville Operators Committee. Max R. Lents has been with Shell Oil Co., Inc., and the Cotton Valley and Haynesville Operators Committees. Both men, University of Oklahoma graduates, are now assistants to the general manager of the Abercrombie - Magnolia cycling project in Old Ocean field 60 miles southwest of Houston.

by Martin G. Miller and Max R. Lents

GAS cycling is a production measure which has developed essentially from two trends in gas conservation:

1. **Elimination of flare gas** by the various regulatory bodies required legal disposal of the gas remaining after separating or processing the production from gas-condensate wells. One form of compliance was underground storage of this residue gas.

2. **Recognition of the phenomenon of retrograde condensation** suggested that a second, and perhaps more important, objective of gas injection into the producing sand might be the maintenance of reservoir pressure.

After 10 years' experience in cycling operations dictated by either or both of these conservation measures, the industry must now examine potential cycling projects in the light of the changing, present-day economic conditions.

Deeper drilling since 1930 has yielded numerous gas fields whose gas production is accompanied by a clear liquid formerly termed "distillate" and now more properly called "condensate." It is now well established that this liquid is the product of condensation resulting from the reduction in temperature and pressure as the gas is brought to the surface and that all of this liquid existed as a gas within the reservoir. In the past, these gas-condensate discoveries were generally without any substantial market for the sale of the residue gas remaining after field separation or plant processing. The wells could not be produced unless there was legal disposition for the residue gas, and gas could not legally be flared. The early projects involving gas injection were largely storage or disposal projects to eliminate the large quantities of gas remaining after processing.

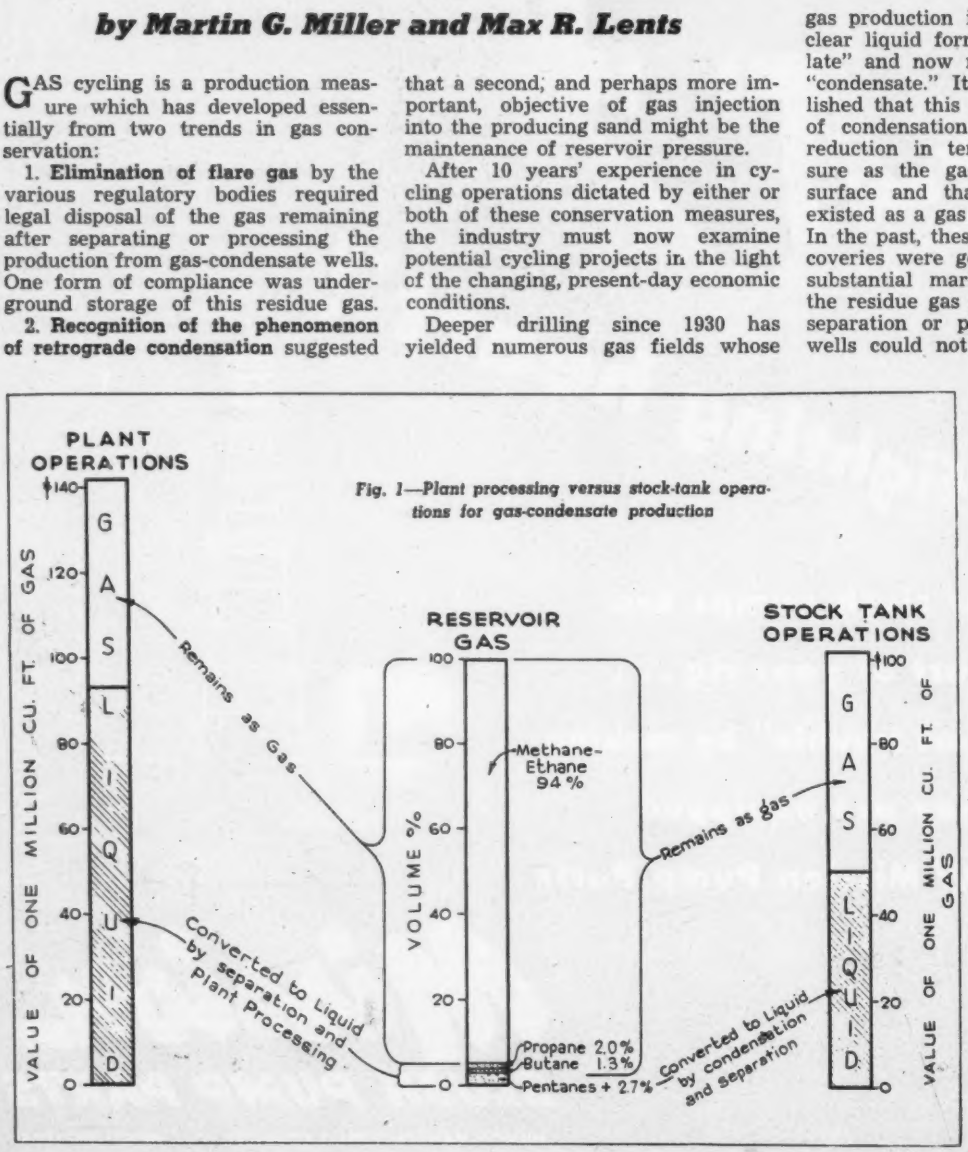

Fig. 1—Plant processing versus stock-tank operations for gas-condensate production

Recognition of the phenomenon of retrograde condensation led many operators and some of the regulatory bodies to require injection of the residue gas into the producing formation to maintain reservoir pressure. It was realized that, if a reservoir containing a hydrocarbon gas of a certain range of composition is depleted without maintenance of reservoir pressure, liquid would condense

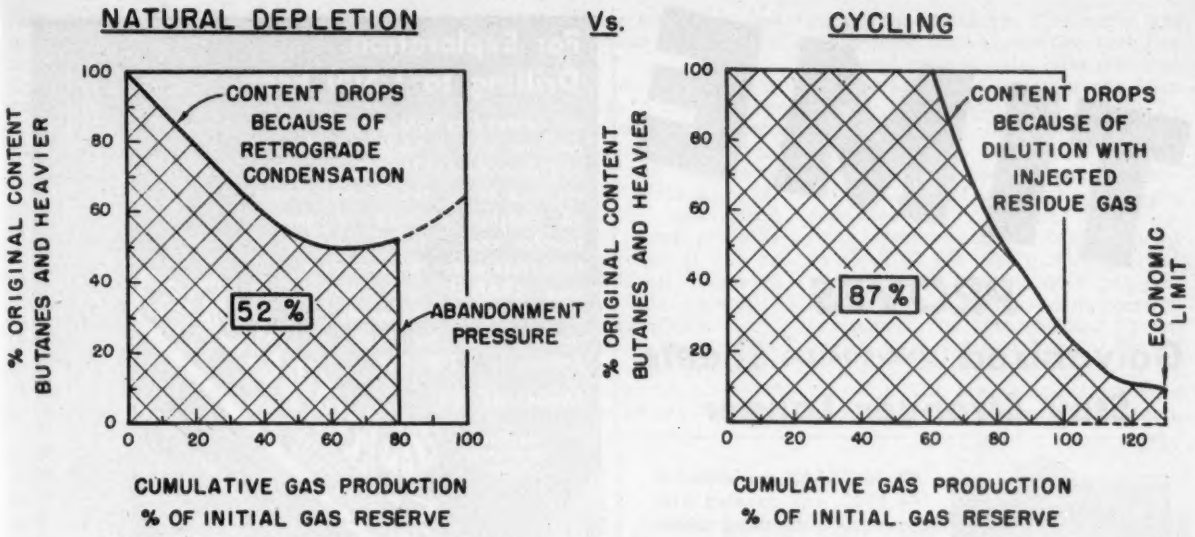

Fig. 2—Production-performance curves—rich-content gas-condensate reservoir, 90 per cent cycling flood pattern

and be precipitated out of the gas within the reservoir. It is generally conceded that most of this precipitated liquid is lost to normal means of recovery.

There are certainly ample field data which have demonstrated this retrograde loss or precipitation within the reservoir in addition to the many laboratory tests which have been conducted. For example, it was noted that the gas wells of a Louisiana gas-condensate field initially contained 115 bbl. of butanes and heavier per M.M.c.f. of gas and that when the reservoir pressure had been reduced 1,000 psi., the gas from the same wells would only yield 75 bbl. per M.M.c.f. of butanes and heavier. This loss in content was before any residue gas had been injected and the decrease was halted when pressure maintenance was commenced.

Similarly, the butanes and heavier content of a Texas gas-condensate field decreased from 74 to 47 bbl. per M.M.c.f. with a reservoir pressure drop of 1,250 psi. Following the institution of a pressure-maintenance program, the liquid content of the gas remained essentially the same.

The Facts

1. The phenomenon of retrograde condensation, whereby some of the gaseous reservoir hydrocarbons are precipitated as liquid within the sand with a reduction in pressure, is well recognized and must be accepted. Properly collected gas samples, when analyzed in the laboratory, seem to provide a satisfactory means of quantitatively determining the magnitude of this loss.

2. In the early operations where gas was injected to maintain reservoir pressure, the process was labeled "recycling." It was thought that the gas would be reinjected several times with the gas picking up liquid each trip through the reservoir. Later data indicate the recycling concept to be false from the practical point of view since the injected dry gas appears to effect its displacement on the first contact and the cycle is complete for economic purposes after injection in the order of 120 per cent of the initial reservoir volume.

3. The path which injected gas will follow within the reservoir and the pattern of the displacement of the reservoir gas may be predicted quite accurately by "model studies" of the reservoir in question. The model most adaptable to these investigations employs the analogy which exists between the flow of electricity through an electrolyte and the flow of fluids through porous media.

4. The electrical model makes predictions for a homogeneous sand.

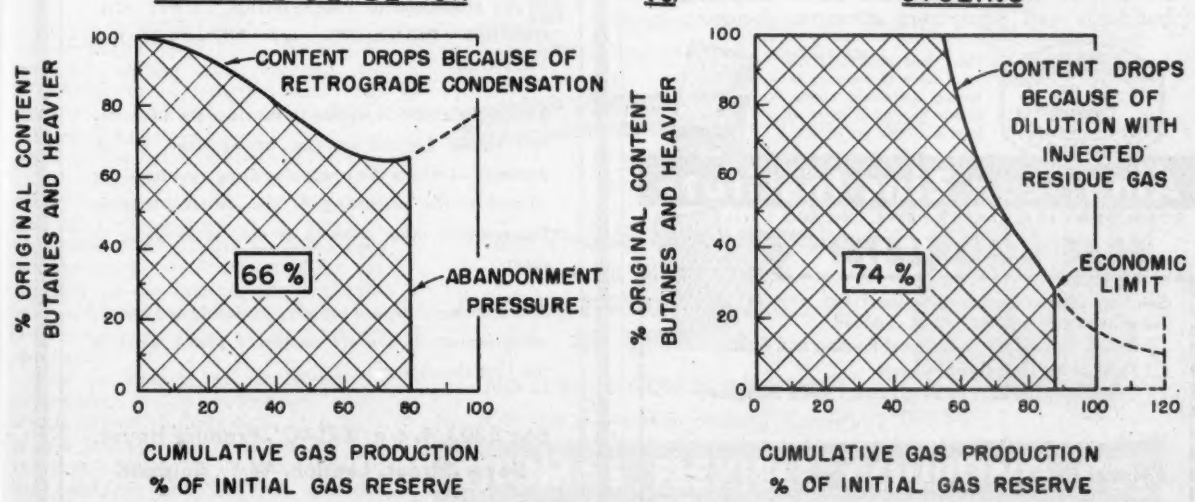

Fig. 3—Production-performance curves—moderate-content gas-condensate reservoir, 80 per cent cycling flood pattern

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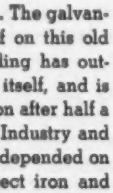

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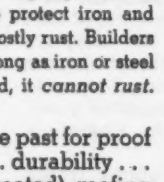

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Correction factors must be introduced to account for the heterogenous character of most reservoir rocks. In several instances, a study of permeability and porosity values obtained from analyzing cores in wells has provided a satisfactory correction factor.

5. It might then seem that all reservoirs should be cycled so that the underground loss due to reservoir pressure drop would be prevented; however, this is not always the case. Formerly, cycling was the only means of providing present income in any substantial quantity from this type of gas property. Rapidly changing conditions indicate that era is passing.

It is our opinion that it is now highly desirable to examine critically the various factors involved such that only those prospects susceptible to cycling are labeled as such and that those gas properties not susceptible to cycling are recognized so that other production techniques may be employed. Given a reasonable amount of normally attainable reservoir data, it is possible to predict reservoir performance under normal depletion and cycling operations with acceptable accuracy.

The Problems

To consider properly the practical aspects of appraising gas-condensate production, it is necessary to appreciate something of the chemical composition of the usual reservoir gases and the portions of which are subject to recovery as liquid under present methods of processing. Fig. 1 illustrates the composition of the reservoir gas from one of the large gas-condensate fields. For simplicity, the components are shown as:

Component—	Volume per cent
Methane	90.0
Ethane	4.0
Propane	*2.0
Butanes	*1.3
Pentanes and heavier	*2.7
Total	100.0

*Subject to liquefaction.

Note that only a small portion (6 per cent) of the total reservoir gas is subject to liquefaction and that under stock-tank operations the value of the liquids recovered is about equal to the value of the residue gas.

The example on the left of Fig. 1 shows the potential value of this same gas after processing in a modern extraction plant. It will be noted that processing (1) has little effect on the quantity of the residue gas available for sale, and (2) substantially increases revenue from liquid products recovered.

This is usually accomplished by processing in an absorption plant which effects liquefaction of a part of the propane and most of the butanes in addition to essentially all of the pentanes and heavier. On the other hand, mechanical separation and stock-tank operations usually recover a liquid volume something less than the liquid volume of the pentanes and heavier.

If cycling would always result in a substantial increase in ultimate recovery of the condensible liquid content which may be recovered from the gas, then it would be much simpler to analyze the economics involved; however, this assumption cannot be made and, more probably for the average reservoir, it can be assumed that additional recovery will not be great. This generality may be illustrated as follows:

The first diagram in Fig. 2 illustrates the performance characteristics of a particular gas reservoir produced under a depletion basis—without pressure maintenance. This curve was constructed from production-performance and experimental data obtained upon a sample of reservoir gas from a rich condensate field. It will be noted that the laboratory analysis predicts that as the gas is removed (and if the pressure drops), the condensible content of the produced gas decreases until it reaches the maximum retrograde, or low content, point at about 62 per cent production, and then increases slightly. At 80 per cent production the abandonment pressure is reached. The area enclosed by the curve (the hatched area) denotes recovery, which in this case is 54 per cent. The abandonment pressure is shown at 80 per cent production.

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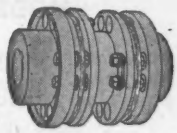
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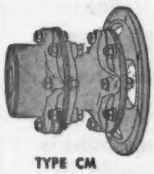
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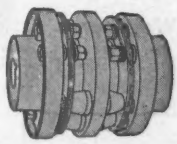
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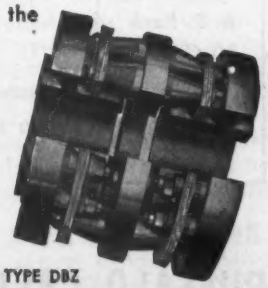
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Some engineers might contend that this very important estimate of abandonment pressure is too high. Actually, there are few reliable data from which the abandonment pressure of deep gas sands may be predicted. In all probability, the low pressures obtained in shallow gas fields will not be approached. When the pressure in a 10,000-ft. well approaches 1,000 psi., operating difficulties may be expected.

The second diagram in Fig. 2 illustrates the results obtained from a well-planned cycling operation of the rich condensate reservoir described above.

Per cent initial content is plotted against per cent production. It will be noted that the content remains the same or 100 per cent of original value to about 50 per cent production and thereafter begins to decrease. The diminishing content is the result of two factors:

1. Because of differences in permeability, the injected gas does not completely displace all of the wet gas ahead of it.

2. The injected gas must conform to a certain geometric shape dictated by reservoir boundaries, relative location of injection and producing wells, and their operating rates.

Due to these influences, the reservoir gas is diluted with residue gas which, having practically no condensable content, reduces liquid recovery from the then diluted produced gas. As production continues, the recoverable content of the gas drops until it reaches a point where the gas does not contain a condensable content justifying processing. At this time the cycling operation is complete, which in this case is at 130 per cent production. The recovery obtained (shaded area under the curve) may be compared with that predicted under the depletion basis.

Fig. 2 is a comparison of increased recovery that may be obtained by cycling. In this case, all conditions are favorable for cycling, namely:

1. Suitable wells are available and the geometry of the field is such that a 90 per cent flood pattern is predicted.

2. Sand conditions are fairly uniform. Structural conditions are good.

3. Condensable content of the gas is high, which permits processing even after considerable dilution by residue gas.

Fig. 3 shows the predicted effect upon recovery by cycling where the gas has only a moderate recoverable content and where only an 80 per cent flood pattern would be achieved within the reservoir. The content of the gas in Fig. 3 is probably more nearly average than that occurring in the example in Fig. 2.

Additional liquid recovery by cycling depicted in Fig. 2 is 61 per cent and in Fig. 3 is 12 per cent. The principal difference in these two examples is that the retrograde loss for the leaner gas is much less than for the richer gas. This is generally true.

It should therefore be realized that:

1. Ultimate liquid recovery may be substantially increased in some gas reservoirs by cycling.

2. In many reservoirs, cycling will have little effect upon recovery.

3. In some reservoirs, cycling will decrease ultimate recovery.

4. It is posible to predict reasonably into which category each reservoir may fall.

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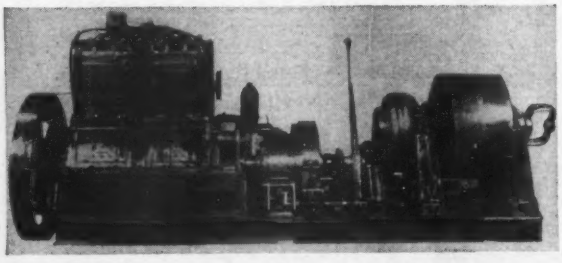

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ELEMENTS OF FUEL TECHNOLOGY. By Godfrey W. Himus. Published by Leonard Hill, Ltd., 17 Stratford Place, W. 1, London, England. 506 pp.

In this volume the author has endeavored to give a brief and simple outline of some of the problems involved in the correct use of fuel. The description and illustration of plant and apparatus have been taken from British practice. Much attention is devoted to correction of wasteful practices. Serious waste has been tolerated in the past because fuel has been relatively cheap, and its cost often contributes but little to the cost of the total production in the factory. Inefficiency has therefore been overlooked in these sections which are directly responsible for using fuel; the boilerhouse has often been neglected, and provided that an adequate supply of steam has been available for the use of other departments, little or no attention has been paid to the efficiency with which that steam has been produced. A more widely diffused appreciation of the principles and application of fuel technology, with which the present book is concerned, is bringing about a solution to the problem of waste.

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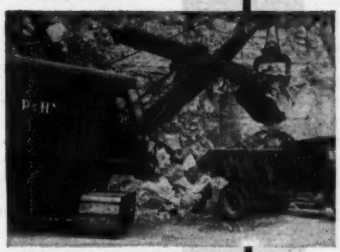

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Use of Unfired Pressure Vessels in The L. P. G. Industry—A Summary

***by E. O. Mattocks** **

THE number of unfired pressure vessels used for the storage of liquefied petroleum gas exceeds that for any other purpose, and probably exceeds the combined number used for all other purposes.

The principles employed in the design and in the use of the unfired pressure vessels by the liquefied petroleum gas industry are different generally from those used for steam-boiler and air-receiver purposes. The main differences are as follows:

1. Since the vapor pressure of liquefied petroleum gas varies with its temperature, the maximum temperature to be expected in a container was determined as 100° F. Therefore the maximum pressure to be normally encountered in an unfired pressure vessel is the vapor

*Technical representative of chemical products and chemical engineering departments, Phillips Petroleum Co., Bartlesville, Okla.

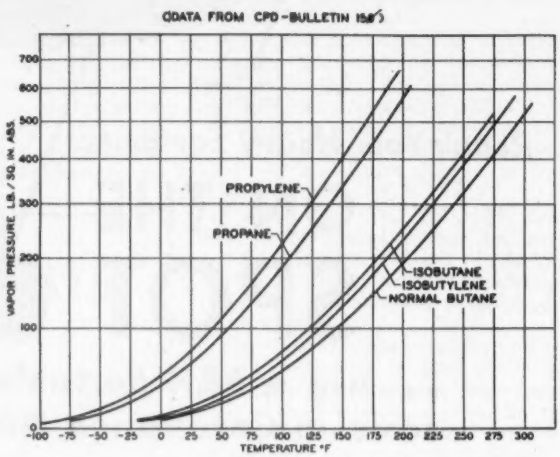

Fig. 1—Vapor pressure of pure liquefied petroleum gases

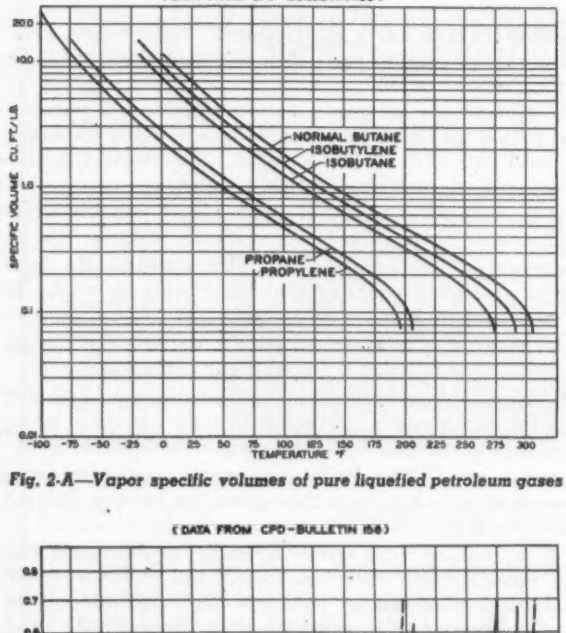

Fig. 2-A—Vapor specific volumes of pure liquefied petroleum gases

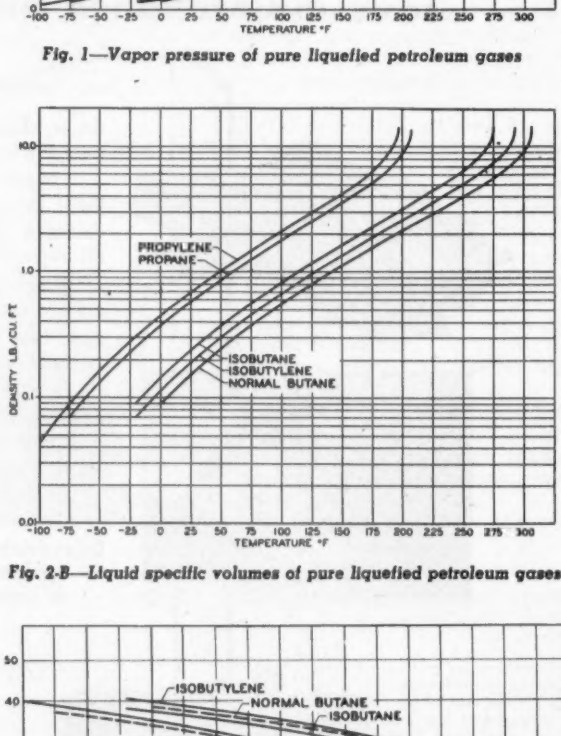

Fig. 2-B—Liquid specific volumes of pure liquefied petroleum gases

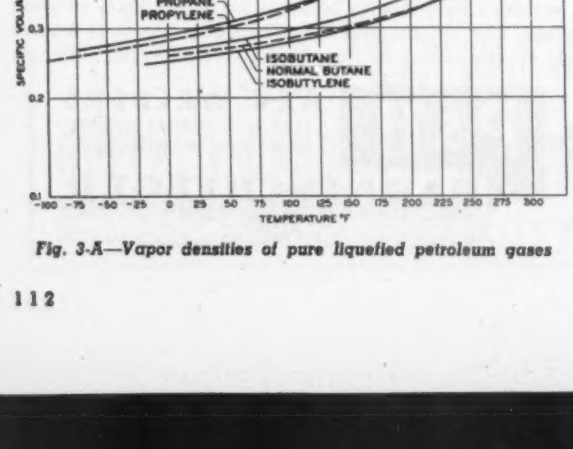

Fig. 3-A—Vapor densities of pure liquefied petroleum gases

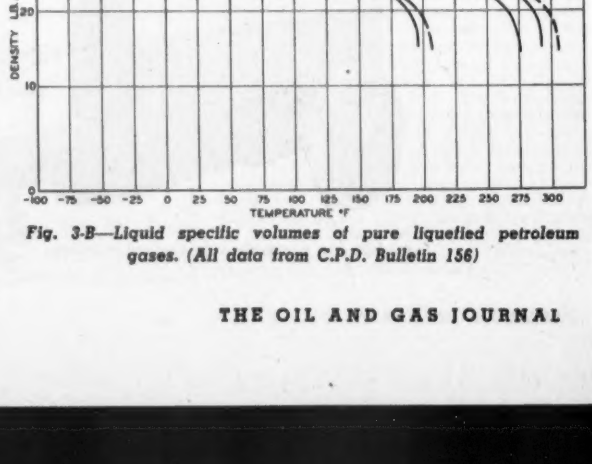

Fig. 3-B—Liquid specific volumes of pure liquefied petroleum gases. (All data from C.P.D. Bulletin 156)

pressure of the product at 100° F. which was established as the basis for determining the design working pressure of a vessel.

2. The average service pressure exerted by the contents on the vessel is approximately one-half of the maximum vapor pressure of the product at 100° F.

3. The design working pressure of an unfired pressure vessel for L.P.G. has been established as follows:

(a) A.S.M.E. Code Paragraph U-68 and U-69—100 per cent of maximum vapor pressure at 100° F. of the L.P.G. to be stored.

(b) A.S.M.E. Code Paragraph U-200 and U-201—112.5 per cent of maximum vapor pressure at 100° F. of the L.P.G. to be stored.

(c) A.P.I.-A.S.M.E. Code 125 per cent of maximum vapor pressure of product at 100° F. of the L.P.G. to be stored.

4. Liquefied petroleum gas is not corrosive to the interior of vessel.

5. Exterior corrosion of aboveground containers is prevented by surface protection.

6. Exterior corrosion of containers buried under ground is prevented by adequate surface coatings and in addition a corrosion allowance is incorporated.

7. Capacities of relief devices are determined by use of Fetterly's formula which provides for very high heat input, compared to other formulas in current use.

8. Relief devices provided to operate only in case of emergencies.

9. Relief devices set so that no product can escape unless valve is required to operate. This is accomplished by use of soft seat or soft sealing rings.

10. Factor of safety of vessels constructed under all codes with relief valve wide open is not less than 3.3.

Unfired pressure vessels used by the L.P.G. industry are protected with excess flow valves which shut off the flow of contents in case of rupture of lines leading to or coming from container. Adequate gaging facilities are installed to make sure that quantity of contents can be determined accurately and thus prevent overfilling of containers. The container is electrically grounded.

The use of two piers to support the tank has proved to be adequate. The use of dikes around tanks appears to provide no protection and may actually induce a hazard which would not exist if they were not present.

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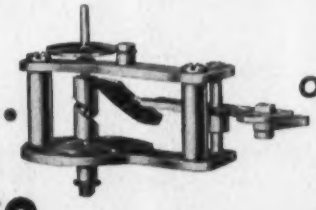

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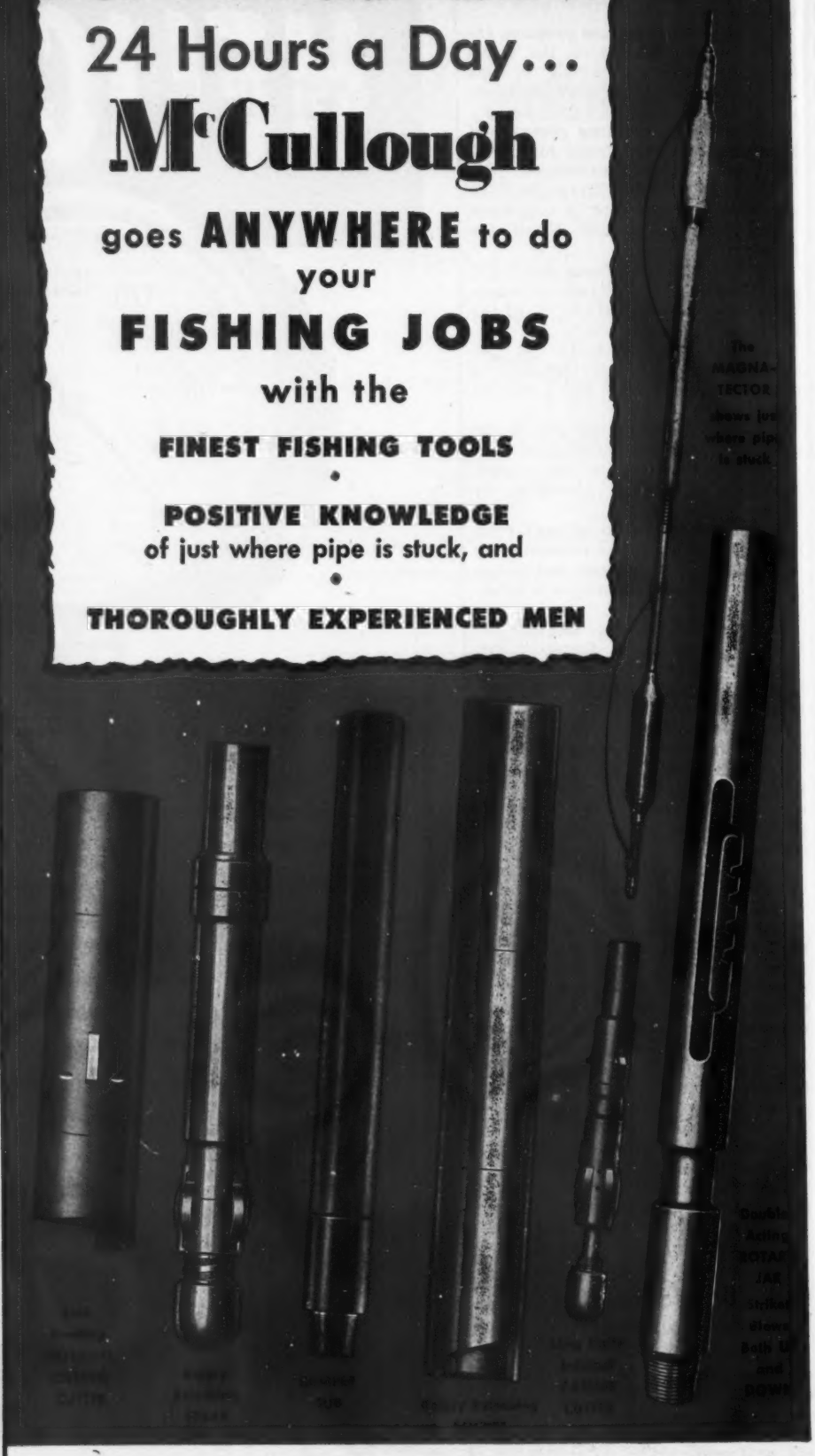

The Refiner's Notebook

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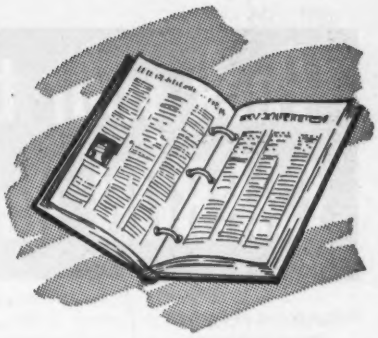

Pressure Drop— Coil-In-Box Condensers

THE pressure drop through coil-in-box condensers as shown in the tabulation on this page is based on the fact that the pressure drop is one-third to one-half as great as it would be if no condensation took place *(The Oil and Gas Journal, May 18, 1944, page 93)*. Note that the total pounds per hour of product, reflux, etc., must be divided by the number of branches or coils that lead from the header as indicated in the headings of the tabulation.

The pressure drop due to the header box which leads into the condenser is somewhat as follows *(The Oil and Gas Journal, April 27, 1944, page 54)*:

Vapor velocity, ft. per sec.	Psi.
50	0.06-0.10
100	0.24-0.38
150	0.54-0.85
200	0.96-1.50

In the tabulation on this page, the header-box pressure drops were introduced by assuming that the average length of coil in condenser boxes is 300 equivalent feet (a very conservative value).

Note that the length to be used with the tabulation is the length of one of the coils, not the total length of pipe in the box. The tabulation is conservative because in compiling it, the assumption was made that condensation is not complete until the end (or outlet) of the box is reached. In most boxes, condensation occurs before the end of the coil is attained and little or no pressure drop occurs in the remaining part of the coil.

APPROXIMATE PRESSURE DROPS FOR 100 (EQUIVALENT) FEET OF PIPE COIL LENGTH PLUS THE ENTRY LOSSES THROUGH THE VAPOR HEADER, PSI.

Pounds per hr. of product, reflux, and steam or gas, through each branch of coil	Gas oil 540° F. and 5 psig.			Regular gasoline (300° F.) and light gasoline (220° F.) at 4 psig.				Pressure distillate, 440° F., 56 psig.			
	2"	3"	4"	2"	3"	4"	6"	2"	3"	4"	6"
400	0.04	....	....	0.08	....	....	....	0.02	....	....	....
500	0.06	....	....	0.11	....	....	....	0.03	....	....	....
600	0.08	....	....	0.14	....	....	....	0.04	....	....	....
700	0.10	....	....	0.18	....	....	....	0.06	....	....	....
800	0.13	....	....	0.24	....	....	....	0.07	....	....	....
900	0.17	....	....	0.30	....	....	....	0.09	....	....	....
1,000	0.20	0.04	....	0.37	0.07	....	....	0.11	0.02	....	....
1,500	0.44	0.80	....	0.80	0.14	....	....	0.25	0.04	....	....
2,000	0.71	0.11	0.03	1.29	0.20	0.06	....	0.40	0.06	0.02	....
3,000	1.53	0.22	0.06	2.78	0.40	0.11	....	0.86	0.12	0.03	....
4,000	2.68	0.39	0.10	4.88	0.71	0.19	....	1.51	0.22	0.06	....
5,000	....	0.57	0.16	....	1.03	0.29	....	....	0.32	0.09	....
6,000	....	0.80	0.23	....	1.46	0.41	0.07	....	0.45	0.13	0.02
7,000	....	1.07	0.31	....	1.94	0.56	0.09	....	0.60	0.17	0.03
8,000	....	1.42	0.41	....	2.59	0.74	0.11	....	0.80	0.23	0.03
9,000	....	1.90	0.50	....	3.45	0.90	0.15	....	1.07	0.28	0.05
10,000	....	2.35	0.62	....	4.28	1.13	0.19	....	1.32	0.35	0.06
15,000	....	....	1.68	....	....	3.05	0.40	....	....	0.94	0.12
20,000	....	....	2.40	....	....	4.37	0.59	....	....	1.35	0.18
30,000	....	....	....	....	....	....	1.30	....	....	....	0.40
40,000	....	....	....	....	....	....	2.20	....	....	....	0.68
50,000	....	....	....	....	....	....	3.30	....	....	....	1.02
60,000	....	....	....	....	....	....	4.50	....	....	....	1.39

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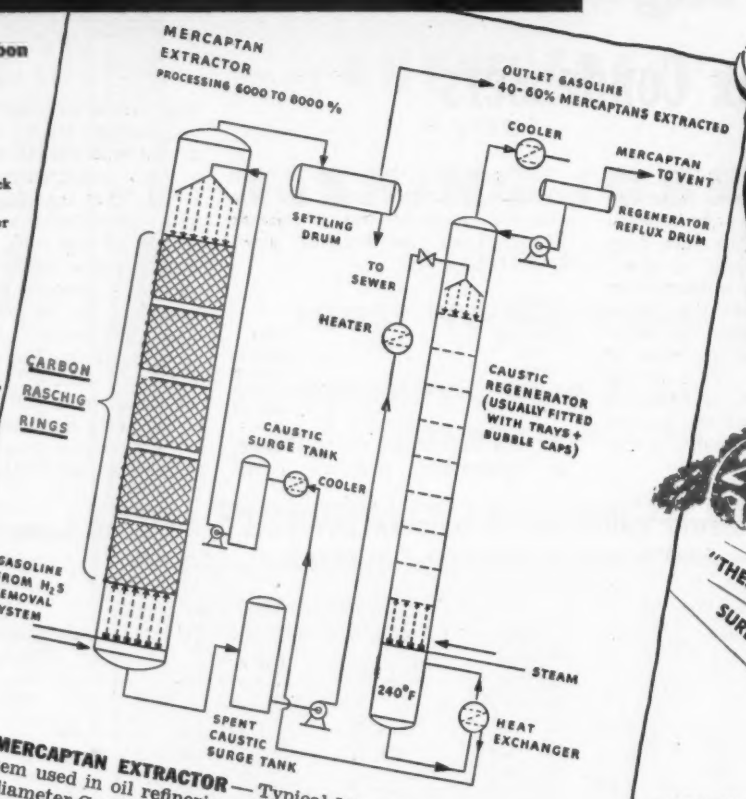
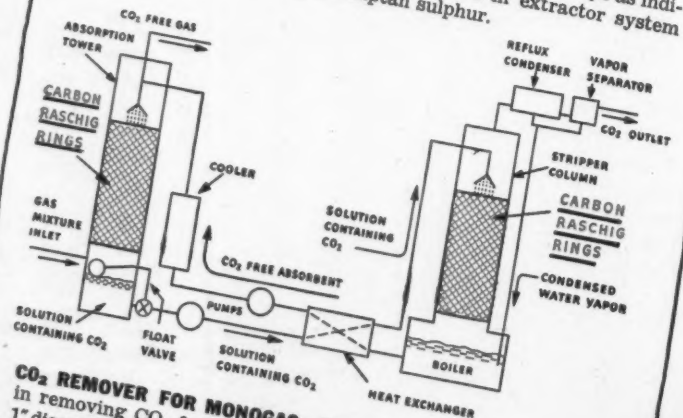


MERCAPTAN EXTRACTOR—Typical Mercaptan extraction system used in oil refineries. Extractor is usually packed with 1" diameter Carbon Raschig Rings, either solid or by trays as indicated. 10% to 20% NaOH solution used in extractor system removing up to 60% of Mercaptan sulphur.



CO_2 REMOVER FOR MONOGAS—Typical extraction system used in removing CO_2 from Monogas. Both towers are packed with 1" diameter Carbon Raschig Rings for maximum contact surface, absence of "channeling," and minimum back pressure. Carbon Raschig Rings are suitable to a wide range of tower-packing jobs.

● "National" "Kempruf" Carbon Raschig Rings provide the most economical and efficient tower-packing material for reaction and scrubbing towers handling corrosive agents, such as hydrofluoric acid, organic-hydrochloric mixtures, and hot aqueous alkalies. These rings are also excellent in extraction systems . . . towers in which sudden temperature changes result in severe thermal shocks . . . rectifying towers . . . and tower processes where thorough dispersion is essential to satisfactory operation.

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ENGINEERING *fundamentals*

A Summary of Reservoir Energies

THE production of crude oil from a reservoir occurs by the action of some natural or secondarily imposed energy. This energy can be present in the form of the gas which is in solution in the oil and which will be evolved under a reduction in pressure, as free gas under compression, as water under compression, as a hydrostatic head of water behind the oil, or as compression of the oil itself. In any given reservoir, any or all of these forms of producing energies may be available. In addition, oil may be produced from a reservoir under the action of either gravitational or capillary forces as was outlined in the preceding instalment.

For the production of crude oil from a reservoir two general conditions are necessary. First, it is necessary that a driving force exist, i.e., between the reservoir and the well bore there must be some pressure differential. It is also necessary that the oil be displaced by some other fluid. The displacing substance may be gas or water. The type of driving energy available determines what will be the nature of the displacing substance. Therefore, the effect of the various reservoir energies is considered in terms of displacing mechanism or efficiency.

Reservoirs are ordinarily classified according to the type reservoir energy that is available because the type of reservoir energy determines the recovery mechanism of the reservoir. We classify four distinct types of petroleum reservoirs, although it is not inferred that all can act independently. These are (1) **solution gas drive reservoirs**, (2) **gas expansion reservoirs**, (3) **water drive reservoirs**, and (4) **gravitational drainage reservoirs.**

By a solution-gas drive is meant the propulsion of oil to the well by means of the gas which comes from solution. This involves the concept of the simultaneous flow of the oil and the gas after it has formed. By free-gas expansion drive is meant the displacement of oil, not by gas flowing with it, but by gas pushing it in the manner of a piston. The differentation of behavior according to the expansion mechanism or to solution gas cannot be made definite, due to the fact that displacement of oil by gas in a piston-like fashion occurs only between zero gas saturation and a relatively low amount of gas saturation. Beyond this saturation range, the piston-like action breaks down to a simultaneous flow and the free gas present then behaves only as additional gas in solution.

Gravitational drainage must be differentiated from solution-gas drive and gas-expansion drive. It is not meant by this statement that the force of gravity is not present in a reservoir. What is meant is that the term gravitational drainage connotes a situation in which there is a countercurrent action. The reservoir liquids flow downstructure and simultaneously the gas moves upstructure. Thus, depending on conditions favorable to the separation of oil and gas, a solution-gas-drive reservoir may give rise to an expanding gas cap.

It should be pointed out that in the majority of known instances, not one, but several of these producing mechanisms may be at work or available. A reservoir is, strictly speaking, a solution-gas-drive reservoir only when the volume is definitely fixed at a constant value; when there is no water available; and when the reservoir permeability, amount of structure, and oil viscosity are such as to preclude absolutely any segregation of gas within the reservoir. On the other hand, a reservoir may be water driven or have water available for drive but not at a rapid enough rate to make the reservoir completely water displaced, in which case it may be substantially a solution-gas-drive reservoir.

It is axiomatic that gas will be produced from solution within the reservoir any time the pressure on the reservoir decreases blow the pressure of saturation. Thus, any reservoir which is subject to a decrease in pressure below the saturation point will have solution gas evolved, which gas will act as a producing and displacing agent. In this sense, very few reservoirs can escape partial control by solution gas.

The operating practices which are imposed on any given reservoir can control those producing energies which are used to the greatest advantage. In a few circumstances where some water drive is available, a gas cap is present, and a large amount of gas is in solution, the operating techniques which are imposed will determine which of these mechanisms or energies are used and to what extent.

It may never be possible to exclude any one mechanism entirely, but it is possible to make any one dominant or insignificant. Such possibilities must be taken into consideration when a reservoir is being analyzed. The factors which were previously enumerated as controlling reservoir forces contribute to the control of producing energy. For example, the internal pore structure of a reservoir and the characteristics of the fluids are important in determining the degree to which any mechanism can be made to operate.

It has been demonstrated by study of various types of reservoirs that it is common to expect the presence of certain types of reservoir energies in definite types of reservoirs. For example, water drive is not usually present to any great extent in a lenticular reservoir because such reservoirs are often stratigraphically sealed on all sides or are not continuous far enough to make any water large enough in volume to be important.

On the other hand, reservoirs which are of wide extent in sands which are uniform and which extend over a large area may very well be subject to water drive. Reservoirs which have much structure and are high in permeability are likely to be gravity controlled. It is furthermore usually anticipated that reservoirs within a given producing horizon will show a characteristic type of producing energy available. For example, the reservoirs in the Smackover lime of Arkansas are usually dominantly water-driven reservoirs. On the other hand, the producing energy of the Appalachian sand reservoirs is predominantly solution or gas-cap energy.

Series prepared by Dr. John C. Calhoun, Jr., Petroleum Engineering School, University of Oklahoma

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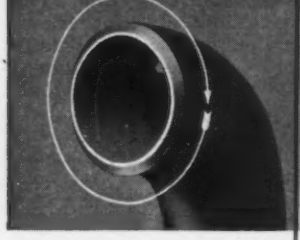

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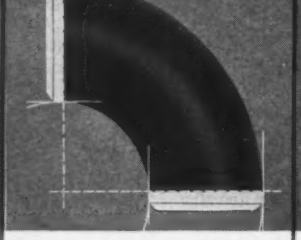

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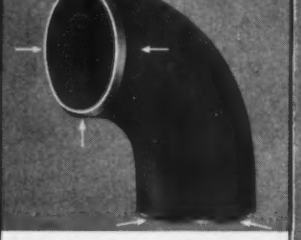

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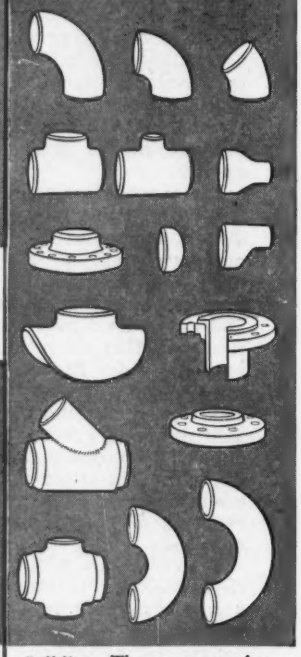

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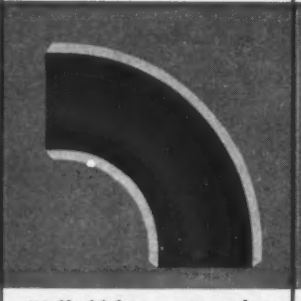

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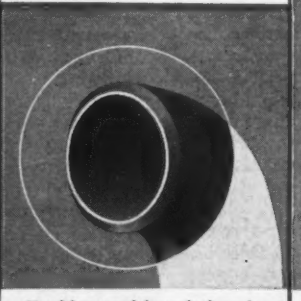

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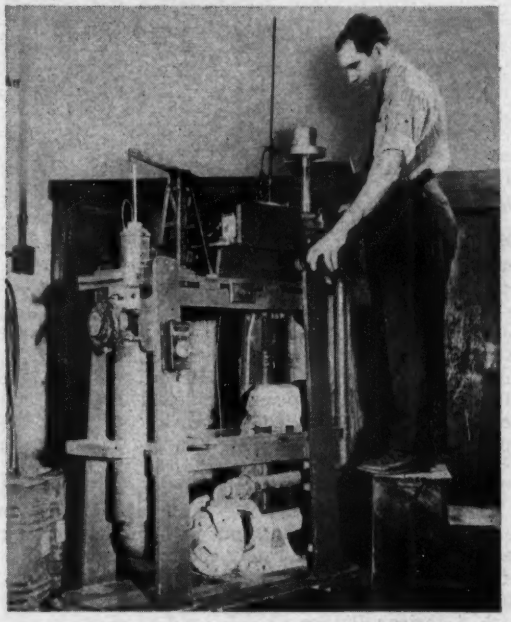
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by John M. Spears

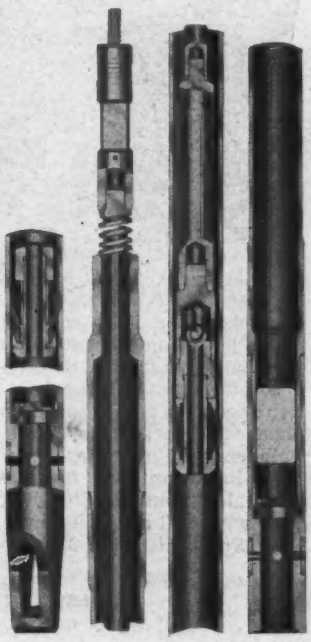
(1) RECIRCULATOR permits accurate evaluation of the effects of chemical treatment on mud. Apparatus permits the treating and heating of mud while it is circulated. Chemicals can be added to mud at any desired stage in the test periods, and their effects studied in about the same way as is done in actual field practice. Contaminating materials may be added to the original mud to determine their effects when encountered in the



field. Viscosity of the mud also can be checked periodically without its being removed from the apparatus. Unit consists of three principal sections: a large centrifugal pump for circulating the mud, a heated section through which the mud flows, and a valve arrangement for trapping mud samples for viscosity checking. Sticking of hot mud on the inner surface of the heated pipe is eliminated by a scraper that traverses the whole heated section. Capacity of the system is 2.6 gal. The mud is circulated at a rate of about 20 g.p.m. Mud system is of copper and brass to minimize corrosion, and the entire apparatus is mounted on a platform supported by dolly wheels to facilitate movement. For measurement of the mud viscosity, a Model LV Brookfield Viscosimeter equipped with variable-speed drive is employed. *Calgon, Inc.*

IT'S NEW CHECK IT

(2) SAND PUMP is used to remove loose accumulations of objectionable material from bottom of bore holes. Sand pumps are not cleanout bailers; they are actual pumps, and in operation suck material into their chambers. Pumps consist basically of an upper tubular section in which the plunger operates, and a lower tubular section which entraps the material to be removed and carries it to the surface for disposal. Rod type or wireline type may be furnished with the flat-type bottom or the chisel-type bottom. Two types of mandrel packing are available in the rod-type sand pump, the "plunger" type or the "swab cup" type. Pumps have a sleeve-type unloading port which is easily opened or closed without special tools. *Grant Oil Tool Co.*



IT'S NEW CHECK IT

(3) GENERAL-PURPOSE ELECTRIC MOTORS include fractional-horsepower-ratings motors; integral-horsepower ratings, single-phase motors; and integral-horse-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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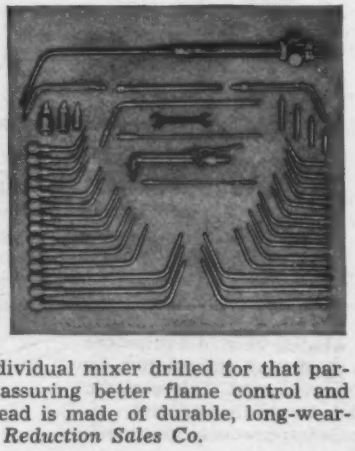
power-ratings polyphase motors. Polyphase, squirrel-cage, induction motor (illustrated) is available in frames 203-326 with N.E.M.A. mounting dimensions. Motor is protected against dripping moisture and falling objects; sheds liquids, dirt, and dust easily. General contours provide smooth, rounded exterior for eye appeal and

to prevent dirt from collecting on motor. Easy accessibility of fittings for greasing, servicing, and disassembly. Large shaft is of S.A.E. 1035 hot-rolled steel and is accurately ground throughout its entire length. Oversize, double-shielded ball bearings are same size and interchangeable, permitting shaft extension from either or both ends of motor as desired. The one-piece die-cast rotor has ventilating fans cast integrally to end rings. Spun-aluminum deflector directs cooling air to the stator coils with cool air pulled into motor by rotor fan blades. *A. O. Smith Electrical Mfg. Co.*

IT'S NEW CHECK IT

(4) OXYACETYLENE WELDING TORCH weighs 1½ lb. and is only 11½ in. long. It has a capacity for single-flame welding tips from Nos. 0-13 inclusive as well as multiflame tips up to No. 15. Torch is suitable for almost any welding job from the thinnest sheet metal up to 1½ in. in thickness. Each welding tip is assembled with an individual mixer drilled for that particular size tip thus assuring better flame control and weld results. Torch head is made of durable, long-wearing monel metal. *Air Reduction Sales Co.*



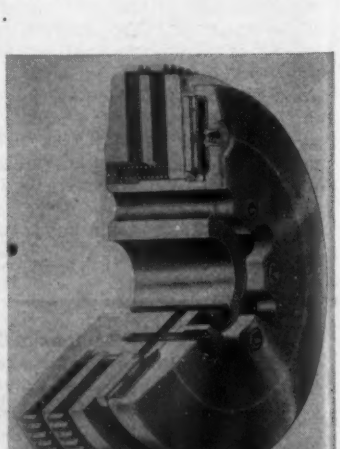
IT'S NEW CHECK IT

(5) FLUORESCENCE ANALYSIS UNIT permits rapid quantative analysis of elemental constituents of chemical mixtures and compounds, minerals, and ores. Its operation depends upon the production of characteristic X-radiations of the various elements present in a substance under investigation and their evaluation. Data so obtained may be readily interpreted in terms of percentages of the elements present. In practice, specimens

under analysis are exposed to an intense beam of tungsten X-radiation, individual X-radiations of the "K" series being generated by elements susceptible to such excitation. The combined radiations representing the various constituents is passed through a special collimating system to a crystal which serves as an analyzer and which, by proper positioning, reflects each of the individual radiations at a specific angle, in accordance with Bragg's Law. Thus singled out, each component of radiation may be measured. This is accomplished through the medium of a Geiger counter which is arranged together with the crystal and its angulating arrangement on a suitable goniometer. Pulses received by the counter are transmitted to a scaling unit and totalized on a register over a suitable, accurately controlled period of time. Determination of percentages of individual constituents can be made on either an absolute or competitive basis. *North American Philips Co.*

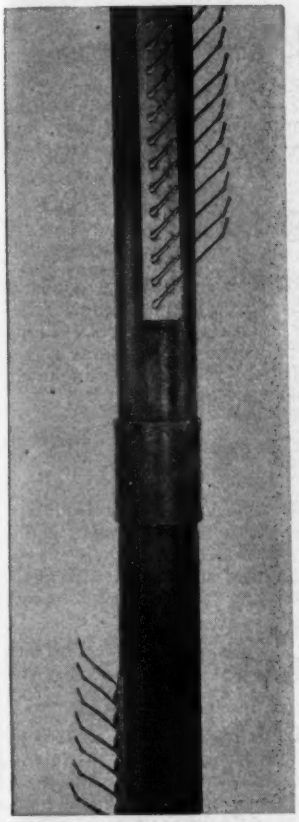
IT'S NEW CHECK IT

(6) NEW FRICTION CLUTCH for heavy-duty applications features direct axial pressure application by compressed air in a flat circular rubber and fabric air tube, to engage the plates of a single or multiplate disk clutch. Clutch requires no adjustments, has great torque capacity for a given diameter and length, and is unaffected by centrifugal force. There are no packing, diaphragms, or gas-



kets. Tube is insulated from heat that might be generated at friction surfaces and air-cooling passages help keep the clutch cool. Clutch is available in 18, 24, and 30-in. single and double plate sizes, having horsepower capacities from 40 to 1,000 hp. *Wichita Falls Foundry & Machine Co.*

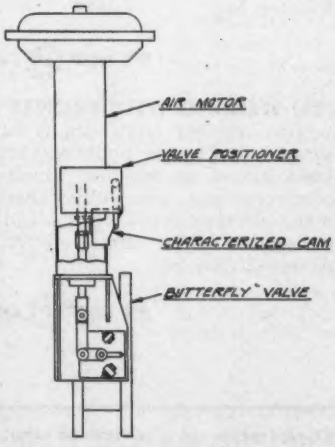
IT'S NEW CHECK IT



(7) NEW ROTATING SCRATCHERS improve the cementing or completion operation by removing mud cake from the formation face just as cement is placed, with the result that cement is well set and closely bonded to the clean formation. Series of strong, multiple-strand spring-steel wire units are mounted on 5-ft. base strips. These strips are spot-welded to the casing or tubing throughout the section or sections of the hole where a complete cement seal is necessary. In operation, pipe equipped with rotating scratchers is run to cementing depth and rotated while the cement is pumped into place. The mud cake removed from the formation face is displaced ahead of the rising cement. *B & W Inc.*

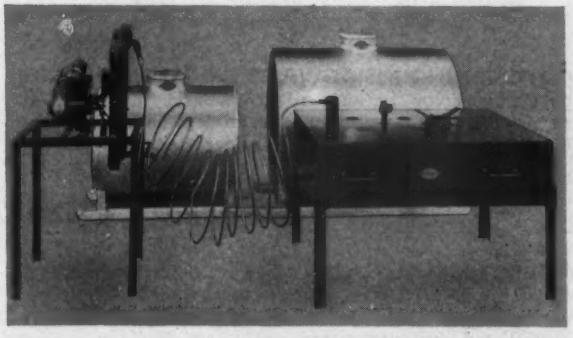
IT'S NEW CHECK IT

(8) NEW VALVE POSITIONER increases range of flow control in disk-type valve. A cam-operated positioner is key feature of a diaphragm motor valve of the disk or butterfly type. Control of flow characteristics is attainable by simply changing cams in the field on the cam-operated positioner, which, in effect, adds to the normal functions of the disk-type valve. The desirable characteristics of a straight-line, semilog curve (V-port), ratio plug valve, throttle plug valve, linear, or almost any other special characteristics to suit individual process requirements, are within the range of the new positioner. Replacing of one cam on the positioner with another of a different shape permits the retention of the basic advantages of the disk-type valve while adding special flow characteristics typical of other valve types. *R-S Products Corp.*



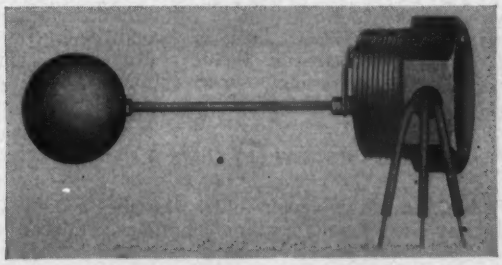
IT'S NEW CHECK IT

(9) WATER PURIFYING UNIT solves drinking-water problem of oil-company exploration and drilling personnel while working in jungle and other locations where water is unfit for use. As unit will distil at the approximate rate of 10 gal. per hour, it is also possible to accumulate a supply of pure water for showers and other purposes. Unit is equipped with 100 and 200-gal. galvanized tanks mounted on skids for storage of drinking and wash water. Units are available with or without tanks. A wood fire is built under the tank, and the steam is condensed in the auto radiator by a fan driven by a small gasoline engine. The sturdy reinforced steel boiler is fitted with carrying handles and detachable legs for portability, and a relief valve for safety. *Ramsey Winch Manufacturing Co.*



IT'S NEW CHECK IT

(10) MAGNETIC PROXIMITY FLOAT SWITCH for liquid-level control service is simple and lacks conventional packing boxes, bellows, or diaphragms. Unit is a magnetic proximity switch containing an Alnico permanent-magnet element. The switch, embodying single-pole double-throw action, has no direct mechanical linkage with the float part of the mechanism. Instead, it is separated by a heavy, nonmagnetic, stainless-steel element located near the pivot point. It also has a differential adjustment for varying the leverage exerted by the weight of the float. *Magneswitch, Inc.*



IT'S NEW CHECK IT

TRADE LITERATURE

(11) MULE-PULL CLUTCHES. New 12-page folder punched for ring binding describes and illustrates expanding-ring and double-disc clutches equipped with non-inflammable friction surfaces, antifriction roller leverage, and ring-oiling lubrication. List prices and dimensions tables included. *Brown Engineering Co.*

IT'S NEW ✓ CHECK IT

(12) "WHAT ELECTRODE WOULD YOU USE to weld a specified stainless or alloy steel?" is title of new two-color, foldout bulletin. Large, four-page table gives trade names of stainless steels. Weld-metal chart and special-purpose electrode list completes information. *Arcos Corp.*

IT'S NEW ✓ CHECK IT

(13) CLEANING INSIDE WALLS OF CASING. New four-page, two-color bulletin describes and illustrates the needs for and application of rotary casing scrapers. Material emphasizes low-cost operation and ease of cleaning. *Baker Oil Tools, Inc.*

IT'S NEW ✓ CHECK IT

(14) ROTOJET TUBE CLEANERS are described and illustrated in new bulletin. Shown in the new bulletin are various types and sizes of Rotojet motors for operation with water, compressed air, and steam. Parts and accessories illustrated, include various types of heads, air valves for one-man operation, lubricators, and hose. Tables list sizes and types of tubes, and specify the tube cleaner recommended for each. *Elliott Co., Roto Division.*

IT'S NEW ✓ CHECK IT

(15) STEAM AND LIQUID-CONTROL EQUIPMENT. Special bulletin features precision pressure regulators, temperature regulators, and combination pressure and temperature regulators, self-cleaning strainers, and steam traps. It includes dimensions, application, capacity, and engineering tables and specifications. *O. C. Keckley Co.*

IT'S NEW ✓ CHECK IT

(16) KEMBREAK. New 12-page bulletin describes new breakover chemical for treating or reconditioning rotary-drilling fluid. Information includes properties, characteristics, treatment prior to use, application, and precautions. *Milwhite Co., Inc.*

IT'S NEW ✓ CHECK IT

(17) DECALS. A two-color folder describes a decal that will "stay put" in all weather conditions. Material emphasizes use for indentification of equipment in all divisions of the petroleum industry. *Miracle Sign Co.*

IT'S NEW ✓ CHECK IT

(18) POWER PUMPS. New 28-page booklet describes pumps for mud service, general service, and for water-flooding. Describes many design features of this machinery not yet generally known to the industry. Twenty-four pages. Illustrated. *Oil Well Supply Co.*

IT'S NEW ✓ CHECK IT

(19) ALUMINUM PAINTS. New four-page mailing piece describes six aluminum paints for refinery and plant applications. Samples of each type are attached. *Detroit Graphite Co.*

IT'S NEW ✓ CHECK IT

(20) PRESSURE PLASTIC LINING for tubular goods is covered in eight-page, two-color bulletin. Material describes process of applying a uniform protective lining of plastic materials to internal surfaces of tubular goods. Cross-section drawings and field photographs included. *Green Contracting & Engineering Co., Inc.*

IT'S NEW ✓ CHECK IT

(21) DEHYDRATOR-WATER pH. A newly revised bulletin features equipment which is said to enable refinery operators to "see" the pH of dehydrator water supply by glancing at the indicating scale of a Micromax recorder. Over-all dimensions and illustrations complete material. *Leeds & Northrup Co.*

IT'S NEW ✓ CHECK IT

(22) HYDRAULIC OIL WELL PUMPING. An eight-page bulletin gives complete information on the weight-counterbalance type of hydraulic pumping unit. Three-dimensional drawings show parts of the unit and principle of operation. Other data give counterweight effect, stroke and load ratings, and reversing control procedure. *Vickers, Inc.*

IT'S NEW ✓ CHECK IT

(23) WELDING WITH BRONZE ELECTRODES. Line of bronze welding electrodes is fully illustrated and described in 24-page bulletin. Considerable emphasis has been placed on welding technique and procedures. A comprehensive weldability chart is included showing many diverse types of application with recommendations as to which bronze electrode to use in each case. *Ampco Metal, Inc.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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REFINING

Synthesis Plant to Be Built Near Garden City

THE $80,000,000 hydrocarbon synthesis plant of Stanolind Oil & Gas Co. will be built near Garden City, Kans., company officials have announced.

Stanolind has 90-day options on two sites about 5 miles east of Garden City and will begin immediately making soil tests and studies of water-supply availability to determine which will be selected.

Company officials said construction on the huge synthesis plant will begin as soon as final site selection is made. Equipment for the plant is now being fabricated, and much of it is ready for shipment.

Processing about 100,000,000 cu. ft. of Hugoton field natural gas daily, the plant will have a daily output of about 6,000 bbl. of liquids, mostly gasoline. It will produce also about 100,000,000 lb. of chemicals a year.

Plans for construction of the plant were first announced early in January by Gov. Frank Carlson of Kansas *(The Oil and Gas Journal, January 8, page 86)* following talks with Stanolind President E. F. Bullard. Bullard at that time declared that engineering on all details of construction was well advanced and said that much of the "long-delivery" equipment already had been purchased.

Basic chemicals—alcohols, organic acids, aldehydes, and other oxygenated compounds—will be produced at the plant under contract to U. S. Industrial Chemicals, Inc., New York, which will have its warehousing and distributing operations located adjacent to the synthesis plant.

Company officials expect an estimated 4,000 workers to be employed during construction, with a permanent operating force of about 600.

Bullard said the plant equipment will include the nation's largest oxygen plant to supply oxygen for the process.

Small Topping Plant to Be Built Near Bishop

HOUSTON.—H. R. Smith and W. C. McBride, Alice, Tex., operators, are preparing to begin construction of a small topping plant in Bishop, Tex., which will process distillate from Bishop and Brayton fields, Nueces County.

The plant will have an indicated capacity of about 1,000 bbl. daily. Products will consist mainly of gas oil, kerosine, and gasoline, and the completed installation will include both bulk station and the small-scale refining operation. The two operators also are planning a small cycling plant with compressors to serve their own wells.

Lion Oil Co. Purchases El Dorado Chemical Plant

Lion Oil Co. has purchased the Ozark Ordnance Works, a chemical plant near El Dorado, Ark., from the Government. The plant, which had been operated from May 1943 to May 1946 by Lion, is one of the largest United States producers of anhydrous ammonia, ammonium nitrate fertilizer, and nitrogen fertilizer solutions.

Since May 1946 Lion has operated the plant under a long-term lease.

The company has issued $20,000,000 in new 3¼ per cent sinking-fund debentures. Proceeds from this new issue have been used to finance purchase of the plant, officials announced.

Building Scheduled at Shell's Deer Park Plant

HOUSTON.—Work is scheduled to get under way next month on construction of a new shop and cleaning building at Shell Oil Co., Inc.'s, Deer Park refinery near Houston.

The building, measuring 458 by 218 ft. with a 40 by 81-ft. offset, will be of steel and transite construction on a concrete slab foundation. The building will be air conditioned. It will be used by the various trades crafts at the refinery. Construction contract has been let to Harold Van Buskirk & Co., Inc. The project is unofficially estimated to cost about $1,000,000.

Lubricants Sales Data Sought in Questionnaire

WASHINGTON.—The Office of Domestic Commerce will mail questionnaires this week seeking information for an analysis of sales of lubricants and allied products in

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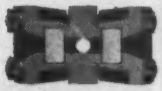

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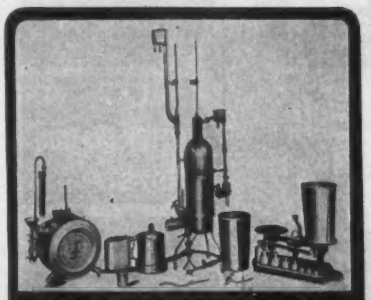

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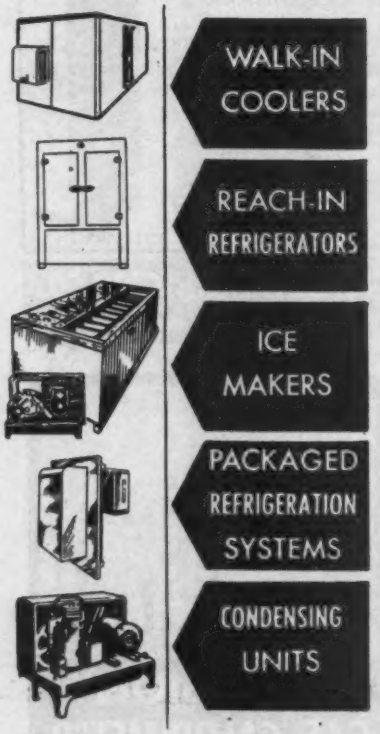

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1947, undertaken in cooperation with the American Petroleum Institute.

The canvass will be the first ever undertaken in this field and, if the results are beneficial, it is believed by the A.P.I. it might be repeated at 2 or 3-year intervals.

To prevent the duplication of figures, each company receiving the questionnaire will also receive a list of all the concerns to which it is being sent and is instructed to omit from its report any material sold to any company listed.

New Process for Making Utility Fuel Gas Revealed

NEW YORK.—A new process for producing standardized utility fuel gas by catalytic cracking of light hydrocarbons appears to offer manufactured-gas companies a solution to the problem of meeting peak demands, according to an announcement by the American Gas Association.

The process utilizes light hydrocarbon stocks such as natural gas, propane, butane, light and straightrun gasoline, or similar materials. Tail gases from oil refineries may be used with good results, it is said, although the presence of olefins may necessitate some changes in operating conditions or catalyst composition. The charge vapors are introduced with steam and air into a heater furnace and to a bedded catalyst of the nickel-oxide type, which converts the charge mainly to hydrogen and carbon monoxide, a step similar in result to the first step of the Fischer-Tropsch synthesis in which the "synthesis gas" mixture is formed. It is also analogous to the first step in the Hygirtol process by which hydrogen is produced for various industrial applications.

The first large-scale unit for this process is being built by Long Island Lighting Co. at Riverhead, L. I., and similar units are planned by Consumers Gas Co., Reading, Pa., and Harrisburg Gas Co., Harrisburg, Pa. Commercialization of the process came through a pilot plant developed by Surface Combustion Co., Toledo, Ohio, and installed at the Chester, Pa., plant of Philadelphia Electric Co.

The process produces a hydrogen-carbon monoxide mixture (Blue Gas) with a B.t.u. value of about 240, and may be enriched by the addition of light hydrocarbons such as natural gas to thermal value of 540 B.t.u. The system offers great flexibility in meeting the specific requirements for gas supply for municipal consumers, as the gas can be interchanged with that manufactured by conventional processes.

Because of the relatively simple setup of the gas cracking system, it may be installed in various places in an extended gas system. As much as 5,000,000 cu. ft. per day may be produced by a unit with an estimated cost of about $1,250,000, according to the A.G.A.

New Type of Grease Developed by Texaco

A new type of roller-bearing grease has been developed for locomotive and car journals it was revealed recently by The Texas Co. The new type of grease is being tested on transcontinental passenger and freight equipment.

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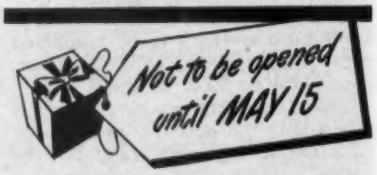

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PIPE LINES

T.G.T. Given Authority For 150 Miles of Loops

HOUSTON.—Tennessee Gas Transmission Co. has received temporary authorization from the Federal Power Commission for additional loop lines and compressor capacity costing about $12,000,000.

The work, together with that previously authorized and now under way, will raise system capacity to 660,000,000 cu. ft. daily. T.G.T. is now working on its second-line program which will bring system capacity to 600,000,000 cu. ft.

The new FPC authorization for the additional 60,000,000 cu. ft. daily throughput provides for 150 miles of 30-in. line to be laid in four localities —near Monroe, La., Greenville, Miss., and Midland and Portland, Tenn. Additional compressor capacity is planned at the following stations: Station 6, Monroe, La., 2,000 hp.; Station 7, Greenville, Miss., 4,800 hp.; Station 11, Portland, Tenn., 1,000 hp.; Station 12, Campbellsville, Ky., 1,000 hp.; and Station 13, Winchester, Ky., 1,200 hp.

Work on the pipe-line looping is scheduled to start as soon as possible, depending on deliveries of pipe. The additions to the existing compressor stations will be undertaken in the near future.

The $12,000,000 program authorized by the commission is a part of T.G.T.'s proposed $150,000,000 expansion which will raise system capacity to 1,055,000,000 cu. ft. daily and include an extension to near Boston. Additional gas made available from the work approved must be sold only to present customers. No hearing date has yet been set by FPC on the remainder of the program which is being contested.

Cushing-Patoka Line To Be Entirely 22-In.

The Cushing, Okla.-Wood River, Ill., crude-oil line to be built by Shell Pipe Line Corp. and Texas Pipe Line Co. will have pipe of 22-in. diameter for its entire length, according to a recent decision.

Earlier plans for the line called for 20-in. from Cushing to Wood River and 16-in. from Wood River to Salem, Ill.

Construction for this 500-mile system has been scheduled to start in October and to be completed to Patoka by March 1, 1949. Throughput will be 186,000 bbl. daily. Pump units will be electric centrifugal.

The Cushing-Wood River leg will be owned 55 per cent by Shell Pipe Line Corp. and 45 per cent by Texas Pipe Line Co. The Wood River-Patoka leg will be owned 100 per cent by Texas Pipe Line Co.

Texas Pipe Line Co. Has 949-Mile Building Program

Texas Pipe Line Co. is in the midst of a huge construction program involving a total of 949 miles of pipe for several projects.

Included in these is the West Columbia-Houston 60-mile, 16-in. crude-oil line for which a contract will be let in 2 months. Contract for the Houston to Port Arthur and Port Neches crude-oil line was recently let.

Within 90 days contract will be let for 175 miles of 24-in. for the Wichita Falls, Tex.-Cushing, Okla., section of the Jal-Cushing System, to be owned by Texas Pipe Line Co., Shell Pipe Line Corp., Empire Pipeline Co. and Sinclair Refining Co. This system is now under construction in the Midland-Wink 253-mile, 22-in. section. Contract has been let for the Jal-Midland 90-mile, 20-in. section.

The company's products system under construction includes the 171-mile Hearne-Dallas and the 110-mile Hearne-San Marcos sections in Texas.

Plans Studied for Texas-California Crude Line

Shell Pipe Line Corp. engineers have been conducting ground reconnaissance as a preliminary step for the Wink, Tex.-Wilmington, Calif., 900-mile, 20-in. crude oil pipe-line project involving several California oil companies and Shell Pipe Line Corp. Although no definite plans have been announced, progress is being made in shaping up the project.

In general the proposed route would be near the routes of the American Telephone & Telegraph Co.'s transcontinental coaxial cable and the Texas-California natural gas line system built by El Paso Natural Gas Co. and the Pacific Lighting Corp. group. However, it would be necessary for the crude-oil pipe line to deviate from these routes in places

where abrupt changes in ground elevation bring hydraulic problems for an oil pipe line which are not experienced in communication of gas-transmission systems.

Need for the line is not anticipated before 1950. Furthermore, pipe will not be available until other commitments are handled by the mills.

Texas Pipe Line Awards Contract to Latex

Texas Pipe Line Co. has awarded Latex Construction Co., Houston, a contract for construction of an 87-mile, 20-in. crude-oil pipe line.

Work is scheduled to begin this month. The line will extend from the company's East Houston station to Port Arthur and Port Neches.

Pipe Delivery Promised For Cities Service Line

Beginning in May, Cities Service Gas Co. is scheduled to receive 27½ miles of pipe each month for use on the west-end section of its new line between Ulysses and Hutchinson, Kans.

Completion of this section for a distance of 181 miles and the Ottawa-Kansas City loop, now under construction, is expected to provide an additional 90,000,000 cu. ft. of gas daily for 1948-49 peak demands on the company system.

Crude Pipe-Line Runs Decrease in Kansas

Pipe-line runs of crude oil in Kansas for the week ended March 1 averaged 291,474 bbl. daily, a decrease of 7,511 bbl. daily, it was reported by the conservation division.

Shell Plans to Lay Two New West Texas Lines

To feed the Jal-Cushing system, also referred to as the Basin System, Shell Pipe Line Corp. plans to build two West Texas crude-oil lines when pipe arrives in the last quarter of this year.

One of these will be a 20-mile, 10-in. line from Wheeler to Wink. The other will be a 73-mile project consisting of 33 miles of 12-in. from Wasson, Tex., to Hobbs, N. M., and 40 miles of 14-in. from Hobbs to Jal, N. M. The latter project will also entail the enlargement of pumping facilities at Wasson and Wheeler. Present Shell lines will be paralleled. Other shippers may utilize the proposed facilities for feeding the new system to Cushing.

Trans-Continental Case Arguments Scheduled

Oral arguments on Trans-Continental Gas Pipe Line Co.'s request for authority to build a $150,000,000 natural-gas pipe-line system has been set by the Federal Power Commission for March 22.

FPC officials said the intermediate-decision procedure will be omitted in this case to provide "timely execution of its functions" in rendering a final decision in the case.

The FPC also set March 15 for the filing of briefs in the case.

The hearing will be on Trans-Continental's request for a certificate of public convenience and necessity for authority to build a new system, designed to transport gas from Texas fields to the Eastern Seaboard.

Gas Pipe Line Planned From Calgary to Winnipeg

OTTAWA.—A private bill is being introduced in the Canadian Senate authorizing the incorporation of the Western Province Pipeline Co. to construct and operate a natural-gas pipe line from the Calgary district as far east as Winnipeg. The main line will follow the route of the Canadian Pacific Railway with branch lines to

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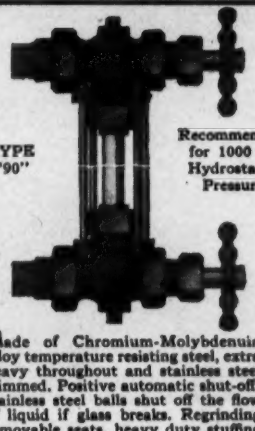

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Saskatoon, Prince Albert and other centers. Construction of gas reservoirs in the Calgary area is also contemplated. Sponsors of the company, all Winnipeg men, are L. D. M. Baxter, Edward A. Nanton, D. A. B. Murray, G. P. Osler and Harold G. Tucker. Cost of the 850-mile pipe line has been estimated at $30,000,000.

Major Additions Planned By Lone Star in 1948

Major additions to its pipe-line system are planned in 1948 by Lone Star Gas Co. Extension of the additions will depend on the availability of pipe and other materials, Lone Star officials said.

During 1947 the company spent $13,777,783 on additions to its system in completing a part of its 5-year, $40,000,000 program scheduled for completion in 1951.

Lone Star's transmission system now totals 5,262 miles. The company operates distribution plants in 332 Texas and Oklahoma cities and towns.

New Gas Pipe Line Map Now Available From FPC

WASHINGTON.—A new map of natural-gas pipe lines of the United States including detailed information on the principal systems of the country has just been published by the Federal Power Commission. The map is so arranged as to make it possible to trace the flow of gas from its sources to the areas of consumption, and it also shows interstate lines authorized but not yet constructed.

All communities having gas service are indicated. This includes communities supplied with natural, manufactured or mixed gas, the type of gas supplied being designated.

Principal gas producing fields are identified by name. From an alphabetical list of operating companies numbered to correspond with numbers on the map, the course of a pipe line company transporting gas from a designated field can be followed to its distribution point. An alphabetical list of principal holding companies numbered in the same manner is also included. From this information a complete picture can be obtained of each system's operations.

Enlarged inserts are shown for such complex areas as Pittsburgh and the Appalachian area, the Monroe, Louisiana, gas field, and the Los Angeles area. Approximate sizes of all pipe lines are given as well as compressor stations of 800 hp. or larger.

Size of the map is 44 by 56 in., with 1 in. representing approximately 60 miles. Printed in 12 colors on heavy map paper and suitable for framing the map is priced at $5 a copy.

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NATURAL GAS

El Paso Gas Asks to Double California Line

WASHINGTON.—A new application seeking authority to double the capacity of its pipe line taking natural gas from West Texas and New Mexico to California has been filed with the Federal Power Commission by El Paso Natural Gas Co.

The project is estimated to cost $81,101,200 and is designed to make an additional 300,000,000 cu. ft. of natural gas a day available to companies distributing and selling natural gas in California including San Francisco, Oakland, Berkeley, and other communities. The amended application was filed as a substitute for an application filed previously.

The company proposed to commence construction as soon as a certificate is granted and to complete such construction in time to commence deliveries of gas through the system by November 15, 1950, and in any event not later than January 1, 1951.

Loops to Total 601 Miles

El Paso Natural was granted a certificate by the commission in 1946 authorizing construction of a project intended to make possible deliveries totaling 305,000,000 cu. ft. of natural gas a day to California distributors. The amended application proposes construction of a series of 26-in. loops paralleling portions of the existing 26-in. line extending from Lea County, New Mexico to a terminus near Blythe, Calif. This looping will be approximately 601 miles long and will increase the capacity of the line from Lea County by 200,000,000 cu. ft. a day. In addition the company proposed to construct a second 26-in. line extending approximately 470 miles from San Juan County, New Mexico, to the vicinity of Needles, Calif. This line would have an initial capacity of 100,000,000 cu. ft. of gas a day and would be connected with the existing 26-in. line by a 24-in. cross-over line beginning about 45 miles east of Blythe. The cross-over line would be about 96 miles long and would have an initial capacity of 200,000,000 cu. ft. of gas daily.

Other facilities proposed include feeder and gathering lines for the transportation of gas from producing wells and fields in the San Juan basin; a gas purification and dehydration plant to be operated in conjunction with the San Juan County line; an 18-in. transmission line from eastern Upton County, Texas, to the company's Jal No. 1 compressor station in Lea County, installation of additional compressor units aggregating 37,000 hp. in existing stations on the Lea County-Blythe line; construction of a 10,800 hp. compressor station; gas purification and dehydration plant and about 16 miles of 10¾-in. line for use in taking residue gas from Seminole field in Gaines County, Texas; and additional facilities for the taking of residue gas from Fullerton field in Andrews County, Texas. These would consist of addition of 7,000 hp. to the existing compressor station, additions to the gas purification and dehydration plant, and about 30 miles of 16-in. loop line to transport the gas to the company's plant near Eunice, N. M.

Panhandle Field Gas Price Hearing Delayed

The Texas Railroad Commission has postponed until May 13 a hearing on the well-head price of natural gas in Panhandle field.

A price must be set in accordance with a law passed by the last Texas legislature requiring that sweet gas used for carbon black be bought at or above the field market price for gas used for light and fuel.

The hearing originally was set for March 4.

Two Committees Studying Gas Industry Steel Needs

A gas-utility steel-requirements committee has been organized by the American Gas Association to make a survey of the steel needs of the gas industry in connection with a program of voluntary allocation now being considered by the steel industry under Public Law 395.

Alexander Macomber, director, Portland Gas Light Co., Boston, who served as director of the manufactured gas division of the Office of War Utilities during the war, has been appointed chairman of the committee by Hudson W. Reed, president of A.G.A. Other members are Eskil I. Bjork, vice president, Peoples Gas Light & Coke Co., Chicago; D. A. Hulcy, president, Lone Star Gas Co., Dallas; and H. N. Mallon, president, Dresser Industries, Inc., Cleveland.

Purpose of the A.G.A. steel committee is to assemble data on all steel requirements of the gas industry except natural gas transmission and gathering lines. A separate committee appointed by the National Petroleum Council will gather statistics on the requirements of the petroleum Industry. As part of this study, a subcommittee headed by N. C. McGowen, president, United Gas Pipe Line Co., Shreveport, is collecting information on natural gas transmission and gathering lines.

The entire steel requirements of the gas utility industry as assembled by the two committees will be collated and coordinated by the Oil and Gas Division of the Department of the Interior and presented to the steel advisory committee organized under the Department of Commerce.

Gas Sales of Utilities Continue to Increase

Total utility sales of natural gas to ultimate consumers in January 1948 amounted to 2,769,608,000 therms, an increase of 4.5 per cent over January a year ago, the American Gas Association reported.

Total sales of all utility gas amounted to 3,204,636,000 therms, an increase of 4.4 per cent over sales in January 1947. For the 12 months ending January 31, 1948, total sales of gas were 29,314,021,000 therms, a gain of 10.4 per cent over the previous year.

Manufactured gas sales totaled 266,000,000 therms, about 12 per cent higher than in January 1947. Mixed gas sales for January of this year totaled 169,028,000 therms, a decline of 7.7 per cent under sales of the previous year.

Fischer-Tropsch Report Series Being Published

A series of 20 selected reports on German developments with the Fischer-Tropsch process for making synthetic liquid fuels has been made available by the Office of Technical Services of the Department of Commerce.

These reports were among the thousands of documents on foreign technology gathered by the OTS immediately after the war and were selected with the view of assisting American firms interested in improving the Fischer-Tropsch process.

In addition to the latest developments in Fischer-Tropsch synthesis, the series covers supplementary processes such as the Lurgi high pressure process and the Thyssen-Galocsy process, and also the uses of byproducts of the synthesis process. These byproducts, OTS says, serve as the starting materials for an entirely new group of potentially valuable petrochemicals such as new synthetic fatty acids, resins, plastics, lubricants, detergents, and solvents, the revenue from which may reduce materially the production cost of synthetic fuels.

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3. Hard-face worn area with 3/16" diameter STOODITE or STOODY SELF-HARDENING. Use either electric arc or oxy-acetylene torch. Apply hard metal in weaving passes parallel to spool axis.
4. Finish grind with tool post grinder or other cylindrical grinding equipment.

NOTE: Pin holes sometimes occur in deposit due to grease particles embedded in pores of parent metal. Although not injurious, they can be removed by spotting with the arc before grinding.

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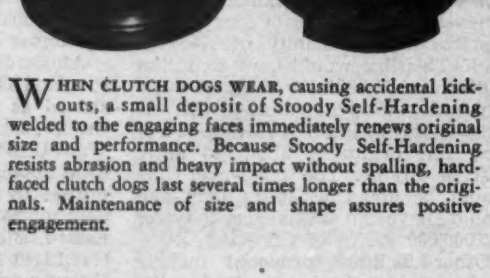

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Among the

Drilling Contractors

New Kansas Drilling Firm to Be Organized

Birmingham & Bartlett Drilling Co., with headquarters in Wichita, will be formed soon by E. L. Birmingham, Jr., and W. N. Bartlett to engage in contract work in Kansas primarily. Richard Hindery will also be a member of the firm.

Bartlett, Jack Heathman, and Joe Honaker dissolved their partnership in H. H. & B. Drilling Co. and the latter two formed Heathman-Honaker Drilling Co. along with R. W. Bailey. Birmingham is presently head of Bay Petroleum Corp.'s exploration department with headquarters in Denver.

Delta Drilling Co., Shreveport, has moved in derrick to deepen Union Producing et al 1 Nebo Oil Co., 30-14n-5w, Saline area, Bienville Parish, North Louisiana, to 10,000 ft. from old total depth of 7,300 ft.

Penrod Drilling Co., Dallas, has contract for two 13,000-ft. tests to be drilled in Jones County, Mississippi, for Placid Oil Co. Wells are 1 Walters, SE SW SW 29-6n-11w, ¾ mile southeast of Ovett Block discovery, and 1 Shows, NE NE 28-6n-11w, 1 mile northeast of discovery. Penrod also has contract for a Georgia test, the Hunt Oil Co. 4 Superior Pine Products Co., Land District 13, Lot 219, Echols County.

Petersen Drilling Co., New Orleans, and Palmer Oil Co. have set surface pipe at its 1-A Curry, NE SW NE 5-16s-19w, extension well to Wasson field, Ouachita County, Arkansas.

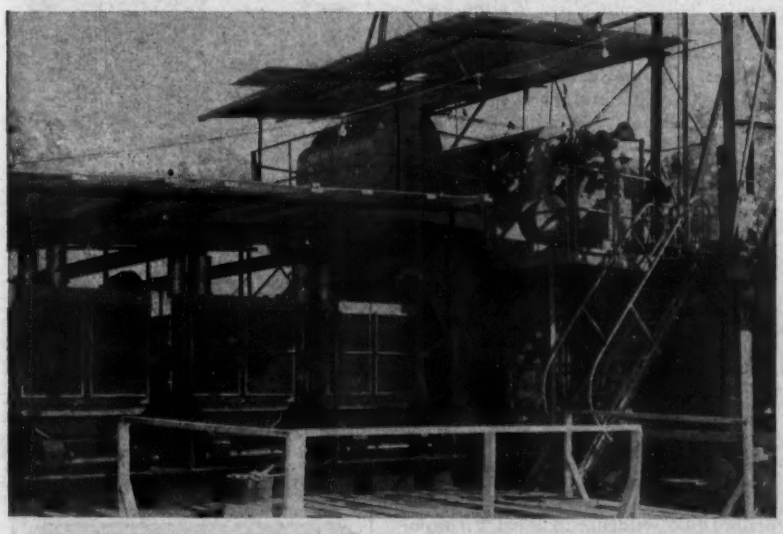
Blount Drilling Co., Oklahoma City, has staked 2 W. F. Scarborough, in northeast of Section 3, Block C-22, PSL Survey, Cheyenne pool, Winkler County, Texas.

John Wilson, Muskegon, Mich., contractor, is drilling a test in Pinconning field, Michigan, on subcontract from Goll, Graves & Mechling, Inc.

Kays & Ganz Drilling Co., a newly organized concern, have offices at 703 Court Building. Evansville, Ind.

N. V. Duncan, Fairfield, Ill., is drilling J. J. Lynn 1 H. O. Nehf, wildcat in SW SE SW 3-1n-5e, Wayne County, Illinois.

Britton Drilling Co. et al, Olney, Tex., have made location for 1 Mooney, W. W. Crisp Survey A-22, Wilson field, 4 miles east of Gainesville, Cooke County, North Texas.



This Big Chief Drilling Co. rig has recently completed a 10,800-ft. Mississippi wildcat operation for Stanolind Oil & Gas Co. See "Running High" on the next page for the story of the growth and activities of Big Chief

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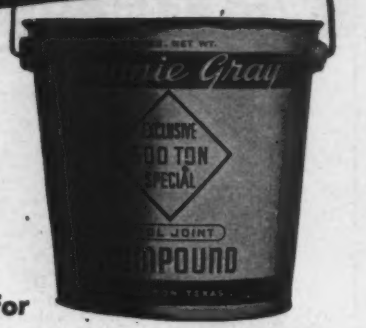

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RUNNING High

Big Chief Drilling Co. Oklahoma City

Growth.—William T. Payne organized Big Chief Drilling Co. in April 1936, entering the contracting game

W. T. PAYNE

J. H. ABERNATHY

with only one diesel rig. Today, Big Chief has 17 strings of tools busy in Louisiana, New Mexico, Oklahoma, Alabama, Mississippi, East Texas, West Texas, and the Texas Panhandle. During its 12 years of existence, Big Chief has built up a monthly production of its own of around 50,000 bbl.

Rigs.—Seventeen rotary power rigs ranging from shallow-depth mast rigs to the heaviest equipment.

Personnel.—William T. Payne, president; Jack H. Abernathy, vice president; S. V. Hodges, vice president and drilling superintendent; H. L. Rowley, vice president in charge of Louisiana and Mississippi; F. E. Godfrey, treasurer; Robert Dalgleish, safety supervisor; George W. Riley, drilling superintendent, Odessa, Tex.; Claude Pool, production superintendent, Oklahoma City; R. E. Fowler, tool pusher, Oklahoma City; Walter Byrd, tool pusher, Odessa; and G. H. Jett, office manager, Shreveport.

Sidelights.—Big Chief has several pool discoveries and extensions to its credit: Contractor on discovery well Montague County pool, West Texas (1940) and Southwest Antioch field, Garvin County, Oklahoma (1946). Discovered Southwest Wayne pool, McClain County, Oklahoma (1946), and had interest in community block which drilled discovery well of Coon Creek field, Logan County, Oklahoma (1946). Brought in two extensions to Northeast Jones field, Oklahoma County, Oklahoma (1947 and 1948). . . . Company has been very active in development of La Grange field, Mississippi, and is one of largest operators in field. Also has substantial interest in Foster and Wasson pools of West Texas. . . . Company has drilled two wildcats in West Virginia, one in Maryland, and is getting ready to start one near Chattanooga, Tenn. . . . A Beechcraft Bonanza is operated by Big Chief to keep up with its far-flung operations.

Glen Peel Drilling Co., Hoisington, Kans., is contractor on Derby Oil Co., and Crow Drilling Co. 1 Kaiser, SE SE NE 16-17-13, extension well to Hoisington pool, Barton County, Kansas.

Holm Louis Drilling Co., Tulsa, with a capital stock of $25,000, has been chartered by the Oklahoma secretary of state. Officers of the new firm are H. E. Holm and J. C. Hatfield, both of Tulsa, and F. M. Rush, Hays, Kns.

Stuart Godfrey, Bangor, Mich., has a rig operating in Peru, Indiana, field, and recently staked a new location near the House-of-David strike, Niles Township, Berrien County, Michigan.

Jackson Drilling Co., Duncan, Okla., has started a 2,500-ft. test, its 1 Brennan, NW NE NW 5-3s-6w, Stephens County, Oklahoma.

West Central Drilling Co. and Ungren & Frazier have drilling started at their 1 W. J. Largent and C. M. Largent, Jr., 5,500-ft. wildcat is in the southeast corner of Subdivision 53, DeWitt County School Land Survey, and 5 miles north of Merkel in Taylor County, West Central Texas.

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HOUSTON 7, TEXAS

Exploration and Drilling

Pennsylvanian Possibilities Near Hugoton Field

A DRILL-STEM test resulting in an estimated 7,000,000 cu. ft. of gas with a spray of distillate, from a Pennsylvanian sand, in a well on the west edge of Hugoton gas field, adds to interest in the Kansas-Colorado-Oklahoma Panhandle corner area. The well is Stanolind Oil & Gas Co. 1 Bear, NW NW SE 17-32s-40w, Morton County, Kansas.

This well topped a Pennsylvanian sand at 4,991 ft., and made drill-stem test at 5,011-17 ft. Elevation of 3,338 ft., places datum on top of sand at —1,653 ft. Drilling has been resumed and the well, now below 5,350 ft., will probably test the Mississippi lime section.

This general area presents an unusual combination of geological and economic problems. The giant Hugoton gas field is a stratigraphic trap in Permian formations, formed by a facies change which pinches out porosity in the limestone reservoirs on the updip side of a monocline.

Northwest, west, north, northeast, and east, small pools of oil or gas have been found in Pennsylvanian sands and Mississippi lime sections; none, so far, have shown signs of being very large. However, relatively few wells have drilled in proportion to the area involved. Economically, with Hugoton already topped by large gas pipe lines, and Stanolind preparing to build a large gas-synthesis plant, new reserves of gas in the vicinity are more than welcome.

The Pennsylvanian sediments thicken from the north and west to the south and east. There are indications that several good sand bodies offer possibilities at various places, and as the section thickens, there should be more sand lenses. There is a substantial, possibly major unconformity at the top of the Mississippian. The Mississippi section is much thicker than in eastern Kansas, a lot of the younger members being present. It resembles the Illinois section and nomenclature from that area is being used.

Tentative tops called on the Stanolind well are: Towanda (Winfield) +998 ft., Lansing(?) —202 ft., and Morrow(?) —1,786 ft. These may be revised after careful sample checking, as calling tops in this section is tricky business. If the Morrow call is good, the gas-distillate sand is in the Cherokee and more nearly equivalent to the Patterson field pay to the north than to that in the Keyes area in Oklahoma.

Correlation problems can be judged by comparison with Argus Production Co. 2 Christopher in NE 10-33s-39w, where the Towanda (Winfield)-Lansing interval was 1,450 ft., as compared to 1,200 ft. in the Bear, provided the same Lansing tops were picked. In Stanolind 1 Trussell in 28-26s-39w, the top of Lansing-Mississippian interval is 1,471 ft. In the Bear, the tentative Lansing and Morrow calls show an interval already of 1,484 ft., with a probable Morrow thickness of over 100 ft. still to go before getting Mississippian.

As Hugoton is a stratigraphic trap, any deeper pays in this field would be pure coincidence. But the general area, lying as it does near the northwest edge of the greater Anadarko basin, looks like an attractive place to search for oil or gas.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

ROCKY MOUNTAIN.—Possibility of an oil ring around a gas cap at Elk Basin Northwest field, Carbon County, Montana, indicated by Stanolind well in 29-9s-23e. Texas Co. strike at Adon, Campbell County, Wyoming, deep Powder River basin, pumped 254 bbl. of 31° gravity oil. Two tests in four state corner area of San Juan basin reach interesting depths.

PERMIAN BASIN.—Sun Oil Co. continues to test second well in Arledge pool, Marble Falls discovery in northern Coke County, after first drill-stem test found no oil. In Pecos County, Chancellor, Slick Oil et al 1 Davis, a wildcat 2 miles west of Pecos Valley, from 853 ft. of Ellenburger pay, reported tests estimated as high as 8,000,000 cu. ft. of gas and 50 bbl. of distillate per hour.

TEXAS GULF COAST.—Miles Production Co. 1 Hills, northwestern Liberty County, flowed potential of 141 bbl. per day to open the Votaw field.

NORTH TEXAS.—Ashland Oil & Refining may have second producer in Westover (Mississippian) field in Baylor County. Its 1 Cockrell recovered oil and gas on drill-stem test.

NORTH LOUISIANA.—Carter Oil Co. deep test in 28-19n-17w, Claiborne Parish, failed to recover any oil shows in five tests between 9,963 ft. and 11,007 ft. total depth.

OKLAHOMA.—Fifth producing horizon looks like possibility at Garden Grove pool, Okfuskee County as Crosbie 5 Schultz in 30-12n-7e, tests Skinner sand at 3,187-3,207 ft.

CALIFORNIA.—San Ardo area of Monterey County being watched as Jergins Oil Co.-North American Consolidated Oil Co. 2 McCool Three, 15-22s-10e tests 50 ft. sand saturation at 1,691-1,756 ft.

CANADA.—Gulf Oil Corp. test of potential discovery of another Turner Valley type field at Pincher Creek in southwestern Alberta foot-hills belt at nearly 12,000 ft., delayed by mechanical problems.

APPALACHIAN FIELD

Jackson County Test Gages Good Gas Flow

PITTSBURGH.—In Grant district, Jackson County, West Virginia, United Carbon et al 1 topped the Oriskany sand at 4,988 ft. in the wildcat on Nathaniel Waterbury farm and shut down at 5,000 ft. with a gage of 8,000,000 to 10,000,000 cu. ft. gas which by morning had increased to 12,000,000 cu. ft. The nearest deep test is about 3 miles to the south. Starting at an elevation of 930 ft., the Corniferous lime was logged at 4,874 ft. Located on the Belleville Quad, it is 4 miles south 39 degrees 05 minutes and ½ mile west 61 degrees 35 minutes.

In Harts Creek district, Lincoln County, United Fuel Gas Co. completed a good Brown shale gas well on Huntington Development & Gas Co. property which had a final gage of 2,442,000 cu. ft. from a total depth of 3,550 ft.

New locations in the state totaled six and were in Fayetteville district, Fayette County; Jefferson district, Nichols County; Grant district, Ritchie County; Davis district, Tucker County; Buchhannon district, Upshur County; Center district, Wyoming County.

In southwest Pennsylvania, new locations totaled five and were in Kittanning, Plum Creek and South Bend townships, Armstrong County; Washington Township, Greene County; North Strabane Township, Washington County.

PENNSYLVANIA SUCCESSFUL WILDCAT

Fayette County, Georges Township: Orville Eberly et al 1 Albert J. Opperman, 1,070,000 cu. ft. gas, elev. 2,358 ft., Tully lime 6,390-6,468 ft., Onondaga chert 6,943 ft., gas 6,949-50 ft., 6,966 ft. and 6,985-98 ft., Oriskany sand 7,093 ft., TD 7,230 ft.

WEST VIRGINIA WILDCAT FAILURES

Jackson County, Washington district: Gay Oil & Gas Co. 1 W. L. Jeffries, dry, Salt sand, TD 1,813 ft.

McDowell County, North Fork district: Hope Natural Gas Co. 9,143 Pocahontas Land Co., dry, Ravencliff sand 997-1,113 ft., gas 1,039 ft., Big lime 2,687-3,525 ft., sand 3,726 ft., Sunbury shale 4,275-4,305 ft., gritty lime 4,305-4,333 ft., TD 4,510 ft.

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CALIFORNIA

Additional Tests Being Made On Monterey County Test

LOS ANGELES.—Jergins Oil Co. and North American Consolidated Oil Co. soon may shed new geologic light on the San Ardo area of Monterey County. According to latest reports, this combination is engaged currently in testing approximately 50 ft. of oil-saturated sand at the interval of 1,691-1,756 ft. in the 2 McCool Three, 15-22s-10e. Results of the tests have not yet been disclosed, although the companies have stated that preliminary tests were considered inconclusive and that additional tests are being made. Main interest in this test centers in the fact that the sand now being tested in the 2 McCool Three is several hundred feet shallower than the productive zone uncovered several months ago by Texas Co. in the first commercial discovery in this area.

Monterey County has long interested oil prospectors due to oil seeps occurring in the Monterey shale, and nearly 60 exploratory ventures have been drilled in the San Ardo area alone in the search for commercial oil production. It remained for Texas Co., however, to make the first discovery with the 1 Lombardi, 27-22s-10e, a wildcat completed in November of last year for 84 bbl. of 10°-gravity crude daily. The discovery failed to unravel the geologic mystery of the area and the Texas Co. put down several additional tests without again being successful. After several failures, The Texas Co. withdrew from the area and left the search up to the Jergins-North American combination, which holds considerable acreage about 1 mile north of the Texaco discovery. These companies first attracted attention last month when their 1 McCool Three encountered interesting oil showings at a structurally higher position than the Texaco well, which was completed at a total depth of 2,158 ft. in an undisclosed formation. The well failed to materialize, however, and the combination carried on with the 2 McCool Three, which they hope will either uncover the new reservoir or present sufficient information to justify a continued search in the area.

Texas Co., following a short period of inactivity, has announced that it will continue its exploratory work in the San Ardo area, and has staked location for the 3 Rosenberg in 34-22s-10e.

First National Finance Corp.'s new well in the Edison area of Kern County apparently is being credited with a discovery. The well, 1 Demille-First National-Jeppi, 17-30s-29e, initially flowed at the rate of 500 bbl. daily of 22.0°-gravity oil from a total depth of 3,449 ft. It subsequently sanded up, however, and operators are now pulling tubing in an attempt to bail and thus restore production. The well is approximately ½ mile northwest of a small reservoir which lies midway between Edison and Mountain View fields. This small field has been referred to as the Arvin area in the past and is a fault-trap reservoir. The new well will probably constitute

an extension of the productive area if it is successfully completed.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Edison area: First National Finance Corp. 1 DeMille-First National-Jeppi, 17-30s-29e, flowed 500 bbl. 22.0°-gravity oil daily through 16/64-in. choke, water cut 5 per cent, top Transition 3,392 ft., oil sand in streaks in interval 3,290-3,449 ft., bottomed in Ash, TD 3,449 ft.

Ventura County, Ojai area: Richfield Oil Corp. 52 Ojai, 13-4n-22w, flowed 165 bbl. in 5 hours, water cut 20.0 per cent, 2,063 ft. perf. liner landed at 3,929 ft., 2½-in. tubing 3,858 ft., TD 3,930 ft.

CALIFORNIA WILDCAT FAILURES

Los Angeles County, East Los Angeles area: Richfield Oil Corp. 4 Vail, 9-2s-12w, dry, 1-hour formation test 8,597-8,630 ft. recovered 50 ft. oil and 110 ft. salt water, TD 8,657 ft.

Monterey County, San Ardo area: Jergins Oil Co. & North American Consolidated Oil Co. 1 McCool Three, 15-22s-10e, dry in granite, elev. 800 ft., top granite 2,324 ft., TD 2,327 ft.

Santa Barbara County, Cat Canyon area: General Petroleum Corp. 1 Fullerton, 31-9n-32w, dry, elev. 760 ft., TD 3,800 ft.

N. CENTRAL TEXAS

Oil and Gas Shows In Baylor County Test

WICHITA FALLS.—Ashland Oil & Refining Co. 1 Cockrell, Block 3,113, TE&L Survey, and south offset to the discovery and only producer in Westover Mississippian field of Baylor County, reported shows of oil and gas in the Caddo. The section was topped at 4,896 ft., and cores from 4,897-4,900 ft. recovered 18 in. of limestone having oil stain and odor. A drill-stem test of the same interval recovered 40 ft. of mud. It was deepened and tested from 4,896-4,906 ft., recovering 1,800 ft. of gas, 50 ft. of gas-cut mud, and 25 ft. of salt water in 2 hours. Drilling ahead, it topped the Marble Falls at 5,159 ft.

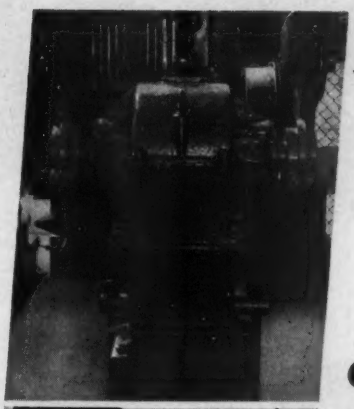
Hunt Oil Co. and Sohio Petroleum Co. this week announced location for a southeast outpost to Sohio's 1 Irl Faver, Ellenburger discovery in Nolan County. The new test will be 1 May Sears et al, 660 ft. from west and 1,980 ft. from north lines of Section 60, Block 21, T&P Survey. It is projected to 6,500 ft. with rotary tools. Skelly Oil Co. announced plans of abandoning its Nolan County test 13 miles southeast of Sweetwater. The 1 W. H. Bradberry, Section 67, Block 20, T&P Survey, was the county's deepest test and had drilled through the Ellenburger and into the Hickory sand to 6,913 ft., with no commercial shows. Top of the Ellenburger was 6,255 ft.

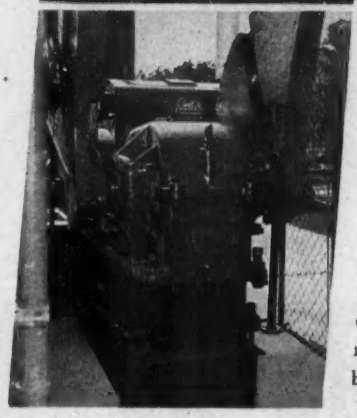
A test was announced for Wise County, which operators classed as a semiwildcat. Burk Royalty Co. 1 J. R. Maguire has been located 330 ft. from south and east lines of H. H. Bradford Survey, and 7,000 ft. north of Cities Service Oil Co.'s conglomerate discovery. The new test is scheduled for 8,000 ft., making it the deepest so far announced for the area. Operations have been delayed by heavy rains.

Standard Oil Co. of Texas 1 Kraeger, Alexander & Richards Survey, semiwildcat in the Sherman field of northern Grayson County, reported several oil shows in the Strawn. Drill samples showed stained sand between 5,572-5,618 ft., shale from 5,618-54 ft., and a fine, tight oil sand from 5,654-67 ft.

NORTH CENTRAL TEXAS (DISTRICTS 7-B & 9) SUCCESSFUL WILDCATS

Montague County: L. W. Barrett et al 1 McCall & Fooshee, J. G. Cox Sur., A-163, 2 mi. SE Mallard, flowed 208 bbl. 40°-gravity oil in 4½ hours, ½-in. choke,





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For over fifty years, it has been our policy to design soundly...*and build in the quality that gives you extra service.* Whether you need a speed reducer, speed increaser, pumping unit—or equipment for special applications our designing skill, engineering talent, and many years' experience in the oil-field business can help you.

Pacific-Western herringbone-gear speed reducers are internally balanced, requiring no thrust bearings. Heavy-duty bearings are used throughout, with no adjustments necessary. These reducers are designed to provide both long life and high gear ratios. Tests show an over-all full-load transmission efficiency averaging 97%.

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Here is encouraging news in the fight against gas-condensate corrosion. The above pictures graphically illustrate how a UNIBOLT high-chrome alloy steel flow bean was unaffected by exposure for more than a year to the same corrosive condensate that practically ate up a plain carbon steel bean in forty-five days.

UNIBOLT Couplings, Tees, Crosses and Chokes of the same high-chrome alloy, which is given a special heat-treatment involving extremely close control of temperatures to obtain maximum resistance to corrosion, have proved equally superior to ordinary steel fittings.

Operators whose wells are subject to gas-condensate corrosion are invited to write for complete details on UNIBOLT High-Chrome Fittings.

Pictured here is a UNIBOLT Flow Man... fold for Christmas Tre... service. Each fitting ... this assembly can b... furnished in high... chrome alloy to resi... gas-condensate co... rosion.

THORNHILL-CRAVER COMPANY
HOUSTON, TEXAS

UNIBOLT High Chrome **FITTINGS**

conglomerate 6,400-10 ft., TD 6,410 ft., casing pressure 900 psi., tubing pressure 180 psi., GOR 600 cu. ft.

Stephens County: Star Oil Co. 1 The Allar Co., B. B. Stancel Sur., 7 mi. S Woodson, making estimated 100,000,000 cu. ft. gas a day through open 2-in., Marble Falls 4,328-32 ft., TD 4,863 ft., PB 4,333 ft.

Wichita County: W. H. Hammon 1 G. M. Thaxton, Blk. 40, K&N Subdivision, Cherokee CSL, 5 mi. SE Wichita Falls, pumped 10.7 bbl. 36°-gravity oil a day, sand 4,456-77 ft., TD 4,477 ft.

NORTH CENTRAL TEXAS (DISTRICTS 7-B & 9) WILDCAT FAILURES

Archer County: Henry Grace Producing Co. 1 A. B. Edwards, Blk. 21, George Bruner Sur., 2½ mi. NW Scotland, dry, TD 5,874 ft., Ellenburger 5,776 ft.

Brown County: H. W. Bockhoff 1 J. T. Reagan, C. B. Trammell Sur., 7 mi. NE Brownwood, dry, TD 2,468 ft., Marble Falls 1,963 ft., show dead oil 2,100-05 ft., Barnett shale 2,135 ft., Ellenburger 2,200 ft.

Eastland County: T. G. Shaw 1 Elzp Been, Sec. 2, GC&SF Sur., 9 mi. SW Carbon, dry, TD 3,597 ft., Caddo 2,523 ft., Ellenburger 3,440 ft.

Jones County: R. R. Carroll 1 G. Herndon, Lot 4, Goliad CSL, League 359, 7 mi. S Hamlin, dry, TD 2,936 ft., sandy lime 2,110 ft., coal 2,914-16 ft.

Panhandle Producing & Refining Co. et al 1 J. L. Roberts, Sec. 46, Orphan Asylum Lands, 5 mi. E Anson, dry, TD 2,650 ft.

Young County: C. H. Peterson et al 1 Delia & Frank Holley, J. W. Paddock Sur., 5 mi. N Loving, dry, TD 590 ft. in sand, show of oil 509 ft.

EASTERN TEXAS

Second Prospect Seen For Trinity County

DALLAS.—Prospects of a second gas field in Trinity County, 10 miles northwest of Magnolia Petroleum Co.'s Glendale gas area, were seen in Humble Oil & Refining Co. 1 Thompson Brothers, John Chambliss Survey. The well was drilled to 10,260 ft., in the Woodbine topped around 9,400 ft. The section was said to have been cored, with no important shows, but electric survey recorded a kick, which prompted the operators' decision to set pipe and test before making drill-stem tests.

In Henderson County, Delta Drilling Co. 1 Lindsay Gauntt, 1½ miles north of Athens, continued testing Bacon limestone perforations between 8,290-96 ft. It was showing some oil and water, and operators thought the water was due to a faulty cement job. In swabbing down to around 4,500 ft. from the top, it recovered oil, some mud, and wash water. An acid treatment of the perforations resulted in swabbing all wash water and acid water.

Two miles east of Patroon, in Shelby County, Humble 1-C Pickering Lumber Co. ran a 1-hour drill-stem test of the Rodessa section between 6,051-6,102 ft. The recovery was 270 ft. of oil and gas-cut mud, plus 180 ft. of salt water. Bottom-hole flowing pressure averaged 202 psi., increasing to 2,760 psi. after shut in 1 hour. It was coring ahead below 6,187 ft. in brownish, gray limestone.

Humble 1-B Pickering, Travis Peak test in Huxley field, was drilling below 5,505 ft. It tested the Rodessa section between 5,375-5,414 ft., with tool open 61 minutes, and recovered 570 ft. of salt water and 180 ft. of mud cut with salt water. Flowing bottom-hole pressure was 150 psi.

In Freestone County, Humble 1 R. P. McWatters was drilling below 11,047 ft. in sand and shale. Humble 1 Whatley was drilling below 4,818 ft. in lime and shale. In Blackfoot field, Anderson County, The Texas Co. 1 Barnard continued swabbing the Pettit between 9,801-9,900 ft., recovering wash water, with no shows. Shell Oil Co., Inc., 1 F. E. Lumpkin, Kaufman County, southwest of Cedarville, had total depth at 10,800 ft. and was shut down for orders after running electrical survey.

In Jefferson field of Marion County, and northeast of Jefferson, Paul H. Pewitt 1-B Ralph was reported drilling ahead below 8,758 ft. It is the area's first test to the Smackover and has attracted considerable interest. It had a drilling break in the Cotton Valley at 8,651-60 ft., but operators did not drill-stem test after running electrical survey.

East Texas operations have been slow, in both completions and new wells. Total completions for the week was 11 oil wells in proven areas. Sam E. Wilson, Jr., 1-B Hearne Estate, classed as a semiwildcat, in Longwood field of Harrison County, extended Goodland limestone pay across the state line from Louisiana into Texas. It had total depth at 5,590 ft. but plugged back and perforated between 2,340-60 ft., and made a pumping potential of some 30 bbl. of 38.5°-gravity oil a day. It was also making considerable salt water. There were 14 new locations in East Texas. Henderson, Marion, Panola, and Smith counties received 2 each, and 1 each was reported in Camp, Gregg, Harrison, Leon, Limestone, and Upshur counties.

CANADIAN FIELDS

Pincher Creek Test Delayed By Trouble

CHATHAM.—In the Pincher Creek area of southwestern Alberta, production test at Canadian Gulf-Pincher Creek 1 deep test, LSD 15, 24-3-29w3, has been delayed by heavy storms, packer troubles, and precautions necessitated by depth and heavy pressure. Test was originally drilled to 11,800 ft., about 100 ft. in Madison limestone, and cemented 7-in. at 11,755 ft. to test the first porous zone of the Madison. When the tester was opened a 3,500-ft. column of water run in to control pressure was shot from the hole, followed by gas under 3,000 psi. pressure and estimated 10,000,000 cu. ft. a day. On closing the tester, pressure increased to 5,780 psi., a record for Alberta, and when the pipe was pulled, the fluid column of 115 ft. showed 105 ft. of light amber oil. Canadian Gulf has staked location for a second well, 1 Walter Marr, about 6 miles north of the discovery. Other companies which hold or are acquiring acreage in the same general area are planning to drill.

Leduc.—Globe Leduc 8, LSD 10, 34-50-26w4, offsetting a D-3 zone producer and finished at 4,964 ft., has been placed on steady production, making around 130 bbl. from D-2 zone, with ¼-in. choke. Home-Leduc 3, LSD 14, 21-50-26w4, drilled out to 5,349 ft., gave flush of 175 bbl. an hour but was later choked down to 198 bbl. a day, and will be run close to the 150-bbl. allowable. Well has a low gas-oil ratio of 200 cu. ft. with casing pressure high at 1,560 lb. Derrick is up for Home-Leduc 5, a D-3 zone test in LSD 12, 21-50-26w4. Continental 1, LSD 2, 9-50-26w4, at 5,410 ft. has been running 219 bbl. on preliminary test, and the company has three other wells drilling.

Imperial 9, LSD 16, 3-50-26w4, testing a possible extension 1¼ miles south and east of the most southerly producers, in drill-stem test of D-2 zone at 5,100-07 ft. got only slight traces of gas. A 45-minute test at 5,113-67 ft. gave maximum of 2,214,000 cu. ft. daily with 15 ft. oil recovery, and a further test at 5,171-88 ft. showed 265,000 cu. ft. with 4,680 ft. oil rise. Further test at 5,188-98 ft. indicated good chances of a producer.

Imperial 33, LSD 2, 21-50-26w4, finished in D-2 zone at 5,110 ft., is testing with a producer indicated. Imperial 34, LSD 9, 9-50-26w4, finished in D-3 zone at 5,504 ft., with salt water, has been abandoned. This test, in the south end of the field, is Im-

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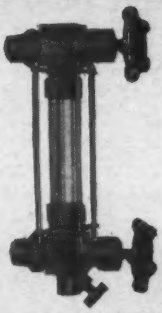

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perial's first failure. Imperial 35, LSD 11, 19-50-26w4, northerly offset to Globe-Leduc West 1 producer in the extreme west of the field, in drill-stem test of the D-2 zone at 5,049-103 ft. showed substantial gas flow followed by oil and is finishing at 5,123 ft. Imperial has five other wells testing, nine drilling with three previous locations and two new wells spotted, Imperial 47, LSD 7, 21-50-26w5, and Imperial-Woodbend 2, LSD 4, 15-51-26w4, in the new northwest extension.

Taber.—In West Taber field, California Standard 85-15A, LSD 12, 15-9-17w4, finished at 3,305 ft., is on pump, making 35 to 40 bbl. daily of 23.5°-gravity oil from the Taber sand. California Standard 81-18A, LSD 4, 16-9-17w4, is drilling.

Barrhead.—In the Barrhead area north of Edmonton, Marine Oil-Alice O'Brien 1, LSD 4, 12-59-3w5, got oil showings in drill-stem test at 2,820-79 ft. but later test at 3,202-25 ft. recovered only salt mud. Drilling is continuing.

Antelope Hills.—In eastern Alberta, British-American Oil Co. will develop acreage in the Antelope Hills area under arrangement with Alliance Oils. Alliance 1, LSD 15, 19-20-1w4, standing 400 ft. in Devonian limestone, at 3,940 ft. will test oil showings and deepen if production is not obtained. Alliance 2, LSD 2, 18-20-1w4, will be deepened to completion from 670 ft.

Ontario.—In Essex County, Ontario, Imperial 3 well on the Elgin Calder farm, drilled 920 ft. east of the discovery well on the Sam Lynn farm, near Staples, encountered a gas flow, estimated at 500,000 cu. ft. in the Salina formation. Following the strike, the oil flow from the Lynn well, which had a reported flush of 144 bbl., halted temporarily. Imperial 2, also offsetting the discovery, is nearing completion.

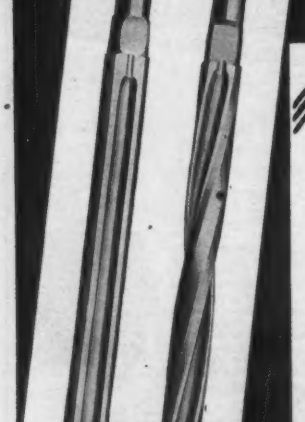

Fig. D360 Fig. D368

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MICHIGAN

Operations Decline Throughout State

SAGINAW.—Michigan oil-field activity last week was down to eight completions, represented by three oil producers and five dry holes, of which four were wildcats. Eight new locations were recorded; two each in Arenac and Berrien counties, one each in Bay, Allegan, Kent and Isabella counties.

The best producer was a Kimball Lake field completion in Newaygo County, with an initial of 1,200 bbl. per day. Other producers were a 60-bbl. well in Monitor Township, Bay County, and a 50-bbl. well in Isabella Township, Isabella County. The slow decline in Michigan production continued, the Oil and Gas Association compilation for January reporting the daily average production as 43,567 bbl. from 3,537 producing wells.

MICHIGAN WILDCAT FAILURES

Allegan County, Martin Township: Louis Zellman 1 Darle J. and Nona M. Lukins, SE SW SW 19-2n-11w, dry in Traverse lime, TD 1,633 ft.

Valley Township: Ohio Oil Co. 1 Jesse E. Walker, SE SE SE 11-2n-14w, dry in Traverse lime, TD 1,488 ft.

Van Buren County, Columbia Township: Otto Ottersky 1 Henry and Ada Robinson, SE NW NE 3-1s-15w, dry in Traverse lime, TD 1,178 ft.

St. Clair County, Kenockee Township: Universal Drilling Co. 1 Dr. Pollack, SE NE SE 15-7n-15e, dry in Dundee, TD 1,255 ft.

ROCKY MOUNTAIN

Stanolind's Test May Go to Madison

DENVER.—Probability of an oil ring around a gas cap at Northwest Elk basin, Carbon County, Montana, is indicated by drill-stem tests in Stanolind Oil & Gas Co. 1 Zaerr, NE NE SE 29-9s-23e. The well made 390 ft. of 33°-gravity oil with 160,000 cu. ft. of gas in a 40-minute test between 6,066-6,100 ft. Tensleep was topped at 6,075 ft. in the well, approximately 350 ft. lower on the top of the Tensleep than Sinclair-Wyoming Oil Co.'s Madison discovery well which was completed last fall. The Sinclair wildcat, ¼ mile northwest of Stanolind's present extension, found only gas in the Tensleep and tested an estimated 5,000,000 cu. ft. of gas with a small amount of distillate.

Stanolind's Zaerr is now reported drilling below 6,138 ft. and may go to the Madison before completion. The area northwest of Elk basin has been of interest since completion of the Sinclair test flowing 4,950 bbl. of oil daily from the Madison. Since that time Sinclair has completed two Frontier producers and four tests are now drilling in the area. The Sinclair well was based on faulting northwest of Elk basin field, currently the largest oil-producing field in Wyoming with production from the Tensleep and Madison formations.

Pump has been installed at Texas Co.'s wildcat discovery well at 1 Unit, C NW NE 2-52n-72w, Adon area in Campbell County, Wyoming, and the well on 24-hour test made 264 bbl. of 31.5°-gravity oil. Production has increased since swabbing tests were made in January, following a small nitroglycerine shot. This test is considered one of the most important drilled in Wyoming in 1947 as it was the first to find production on a geophysical high in the center of the Powder River basin. A very active lease play was made by a number of operators through the basin as a result

of this discovery, and it is expected that geophysical activity will increase considerably in the basin during the coming year.

In the San Juan basin at the four-corner junction of Colorado, Utah, New Mexico, and Arizona, Byrd-Frost, Inc., Western Natural Gas Co. and Paul B. English are at interesting depths on two rank wildcat ventures. At McElmo Dome, Well 1 McIntosh, C NW NW 25-36n-18w, the operators are drilling below 4,575 ft. in the Paradox. Top of the Paradox was reported at 4,455 ft. Shows of oil were found in the Shinarump sand and a show of gas was logged in sand between 3,853-60 ft. This well is ¾ mile south of a well drilled by Stanolind to 7,046 ft. in 1943. Fifty miles southwest at Boundary Butte, San Juan County, Utah, the same operators are now drilling below 5,634 ft., probably in the Mississippian, on a wildcat test scheduled to go to 7,500 ft. Shows of gas were reported between 4,630-675 ft. At Boulder Knoll, northern San Juan County, Utah, the companies are now preparing to plug back and test the Molas section after finding water in the Madison at 8,789 ft., total depth.

Stanolind's first Madison test in Torchlight field at 2 Orchard Unit, SW NE SE 24-51n-93w, has found water in that horizon. The well topped the Madison at 3,362 ft. and on drill-stem test in the top of the formation recovered oil. However, in 1 hour between 3,588-3,658 ft. the well made 150 ft. of oil and 40 ft. of water and between 3,648-58 ft. the recovery was 30 ft. of oil-cut mud and 60 ft. of fresh water. A Madison well drilled on the flank of the structure several years ago found water in that horizon This well is located ½ mile southwest of the Tensleep discovery well drilled by Stanolind last fall, and Tensleep in the present test showed 90 per cent water on drill-stem test, before deepening to the Madison.

The California Co. reports its deep test at 1 Tierney, C NE NE 15-29n-115w, Snider basin, Sublette County, Wyoming, on the west side of the Green River basin, as drilling below 8,969 ft. This test, one of the most interesting in Wyoming, is in the thrust-fault belt northwest of LaBarge field, which produces oil from shallow Tertiary sands. No report has been made by California as to formation tops or shows in the wildcat.

New operations.—There were 14 new locations in the Rocky Mountains, with 8 in Wyoming, 3 in Colorado, and 3 in Montana. In Colorado a group of individuals from Colorado and Kansas made location for a wildcat test of the Denver basiin, just east of the city of Denver. The well is Suhr, Trickett & Fielder 1 Miller, SE NE SW 19-3s-66w, Adams County. It is reported the well will be drilled to test the Dakota, possibly as deep as 8,000 ft. E. K. Carey Drilling Co. is now rigging up rotary for this test. Other first reports were for pool tests, including three minor extensions in the Mush Creek area, Weston County, Wyoming, which has been very active following good completions in the Newcastle sandstone at around 4,000 ft.

Completions.—There were 19 completions listed this week, with a total initial production of 1,345 bbl. of oil. Eight of the wells were in Montana, six in Wyoming, five in Colorado, and one each in Utah and northern Mexico. Completion of the Little Round Mountain wildcat in Lincoln County, Wyoming, by Union Oil Co. and Carter Oil Co. as a dry hole may slow further development in the thrust-fault area along the southwest side of the Green River basin. The well encountered two thrust faults and three sections of Phosphoria were drilled. The Weber in this well showed some porosity, but no saturation. One slight show of oil was encountered in the Phosphoria, but this section failed to show oil on drill-stem test. This unit is on the south side of the Meridian anticline and other drilling blocks are held in the area. In Utah at Castle Dale, Kralik Oil Co. has temporarily abandoned a wildcat test after finding water in the Navajo sand. The well was drilled to 3,600 ft. with Navajo at 3,540 ft. Other completions were pool wells with the exception of a shallow test in the Chromo area, Archuleta County, Colorado, which tested water in the Dakota.

WYOMING WILDCAT FAILURE

Little Round Mountain, Lincoln County: Union and Carter 1 Gov't C-155, NW NW NE 30-20n-115w, 6,155 ft. TD, dry; Twin Creek 450 ft., Nugget 665 ft., Ankarah 1,000 ft., Thaynes 1,550 ft., Dinwoody 3,490 ft., Phosphoria 4,050 ft., Thrust Fault 4,360 ft., Dinwoody 4,360 ft., Phosphoria 4,640 ft., Weber 5,050 ft., Thrust Fault 5,350 ft., Phosphoria 5,350 ft., Weber 5,750 ft., elev. 7,109 ft. KB.

COLORADO WILDCAT FAILURE

Chromo, Archuleta County: L. E. Teague 2 Shahan, C NW NW 4-32n-1e, 1,015 ft. TD, dry, Dakota 945 ft., water.

UTAH WILDCAT FAILURE

Castle Dale, Emery County: Kralik Oil 1 State, NE SW SW 32-18s-9e, 3,600 ft. TD, temp. anbd., Dakota 850 ft., Morrison 900 ft., Navajo 3,540 ft., water.

TEXAS GULF COAST

New Oil Field For Liberty County

HOUSTON.—A new oil field for Liberty County, Cleveland field area, has been opened by Miles Production Co. 1 Julia Hills, located in the F. H. Votaw Survey, approximately ½ mile southeast of production in North Cleveland field. Drilled to a total depth of 5,787 ft., this well flowed on potential gage 141 bbl. of 41.2°-gravity oil per day through a 10/64-in. choke with 725 psi. flowing pressure on

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tubing and gas ratio of 1,163. Production is from the Yegua sands, perforations at 5,687-92 ft. Operators are asking for a discovery allowable and rights for the new area for the new area to be named "Votaw."

The first production from the Yegua zone at Brandt field, Goliad County, has been opened by Sun Oil Co. 1 Goehring, located in the A. Mancha Survey. Top of pay 4,707 ft., with perforations for completion at 4,707-20 ft. On potential gage the well flowed 51 bbl. of oil per day through a ½-in. choke, gas-oil ratio 500, tubing pressure 850 psi., and gravity 45°.

Potential gage has been reported for opener of Glasscock field, Calhoun County. C. G. Glasscock, Jr. and Pontiac Refining Co. 1 T. A. McDonald, located in R. Garrett subdivision, I&GN Survey 6, flowed 112 bbl. oil per day through a ½-in. choke, gas-oil ratio 1,240, with pressure 900 psi., casing pressure 1,020 psi., through perforations at 7,268-69 ft.

A new sand for East Beech Creek field, Hardin County, has been opened by American Republics Corp. 1 H&TC Fee-Section 199, H&TC Survey, through perforations at 6,653-57 ft., top of sand 6,653 ft. On potential gage the well flowed 102 bbl. oil and 39 bbl. salt water per day through ½-in. choke, gas-oil ratio 539, tubing pressure 720 psi., gravity 40.1°. Total depth is 7,550 ft. The company now drills the 2 H&TC fee which is ¼ mile southwest of the No. 1 well.

Sun Oil Co. 1 Ruby Bossier, wildcat test south of Huffman townsite, Harris County, in the F. Rankin Survey, developed 48 psi. top pressure in 20 minutes and flowed the water cushion on drill-stem test using ¼-in. choke from 8,140-67 ft. Tool was pulled and recovered four stands of oil, mud, and water, and two stands of salt water. Operators cored ahead to 8,294 ft. and now preparing to set pipe for a production try.

There were 36 new locations reported this week for Districts 2 and 3, with 6 being wildcat starts, 4 in Live Oak and 2 in Refugio counties. Four successful exploratory tests were completed, one each in Calhoun, Goliad, Hardin, and Liberty counties, while seven wildcats were dry, one each in Austin, Bee, Brazoria, Chambers, Jefferson, Live Oak, and Victoria counties.

TEXAS GULF COAST (DISTRICTS 2 AND 3 SUCCESSFUL WILDCATS)

Calhoun County: New oil pool "Glasscock"—C. C. Glasscock, Jr., and Pontiac Refining Co. 1 T. A. McDonald, in Sec. 19, R. Garrett subd. 1, I&GN Sur. 6, 7 mi. SW of Port Lavaca and 4 mi. S-SE of Sheriff field, top pay 7,264 ft., TD 7,304 ft., perf. 7,268-69 ft., IP: 112 bbl. oil per day through a ½-in. choke, GOR 1,240, TP 900 psi., CP 1,020 psi., grav. 41.2°, no water.

Goliad County: New oil pay Brandt pool—Sun Oil Co. 1 Robert F. Goehring et al, in A. Mancha Sur., 3 mi. NE of Weesache and 1½ mi. NW of Weser field, top pay 4,707 ft. (Yegua sand), TD 7,725 ft., perf. 4,707-20 ft., IP: 51 bbl. oil per day through ½-in. choke, GOR 500, TP 640 psi., CP 850 psi., grav. 45°, no water.

Hardin County: New oil sand East Beech Creek field—American Republics Corp. 1 H&TC-Fee-Section 199, in H&TC Survey, Sec. 199, top sand 6,653 ft., TD 7,550 ft., perf. 6,653-57 ft., IP: 102 bbl. oil per day and 39 bbl. salt water per day through ½-in. choke, GOR 539, TP 720 psi., grav. 40.1°, 27.6 per cent water.

Liberty County: New oil pool—Miles Production Co. 1 Julia Hills, in F. H. Votaw Sur., ½ mi. SE of North Cleveland field production and ½ mi. N of old Cleveland field production, TD 5,787 ft., top sand 5,687 ft., perf. 5,687-92 ft., IP: 141 bbl. oil per day through a 10/64-in. choke, GOR 1,163, TP 725 psi., grav. 41.2°, no water. (Operator asks discovery allowables and for field to be named "Votaw.")

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TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Austin County: Union Producing Co. and Shell Oil 1 Julius Brune Unit 3, H&TC Sur. 163, in Sealy gas area, dry, TD 9,298 ft.

Bee County: W. C. McBride, Inc. 1 C. C. Diebel, in C. C. Diebel tr., in C. Molina grant, 4½ mi. NE of Beeville, dry, TD 5,553 ft.

Brazoria County: Woodley Pet. Co. 1 Mattie B. Williams et al, in A. Darst Lge., S flank of Damon Mound, dry, TD 2,140 ft.

Chambers County: J. W. Frazier and Peeler Bros. 1 DeVallier & Sterling, T&NO Sur., Sec. 40, 3 mi. NW of Winnie townsite, 4 mi. W of Winnie field prod., dry, TD 9,013 ft.

Jefferson County: Stanolind 1 J. E. Broussard, E. D. Chenneth Sur., 2½ mi. S of Spindletop dome, dry, TD 10,079 ft.

Live Oak County: Western Nat. Gas Co. 1 J. E. Wallace, in Geo. Coulton Sur., 1.3 mi. S-SE of Geo. West townsite, dry, TD 9,433 ft.

Victoria County: Hiawatha O. & G. Co. 1 Anton Otto, in Fernando De Leon Gr., 5½ mi. SE of Inez, dry, TD 6,815 ft.

LA.-ARK.

No Oil Shows Yet On Claiborne Deep Test

SHREVEPORT.—Carter Oil Co. made extensive tests at its Claiborne Parish deep wildcat, the 1 Gandy, SW NW 28-19n-7w, and recovered gas-cut mud from a number of sets of perforations, but had no shows of oil. Total depth is 11,007 ft., in the Cotton Valley, with the tests ranging from bottom up to 9,963 ft.

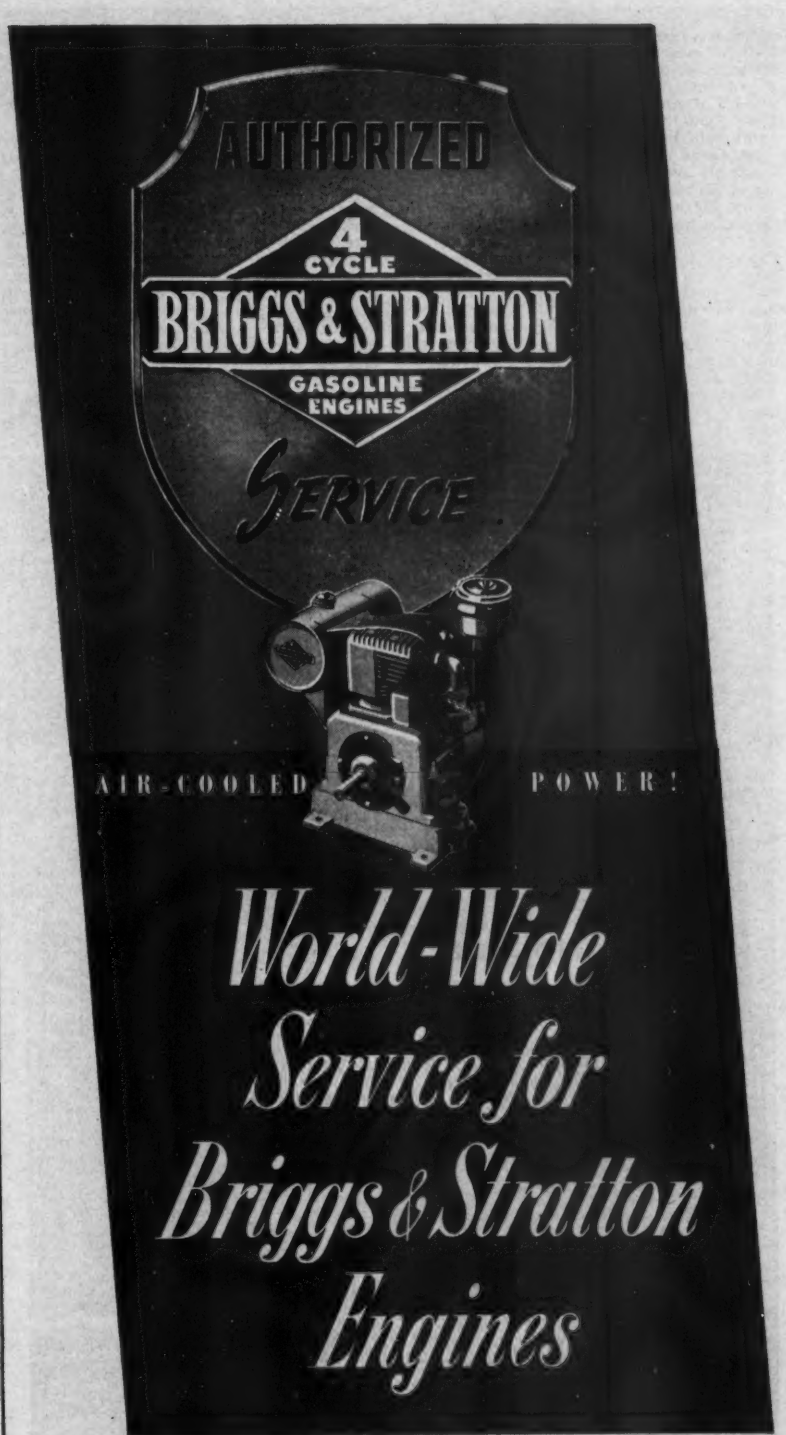
Between 10,816-11,000 ft., using ¼-in. top and ½-in. bottom chokes, and 2,000 ft. of water cushion, it produced a slight blow when the tool was opened, and in 45 minutes recovered 540 ft. of gas-cut mud. During the test period the tool was shut and reopened three times. From perforations at 10,739-755 ft. and 10,708-723 ft., with packer at 10,620 ft., it produced a slight blow and in 30 minutes recovered the water cushion plus 800 ft. of gas-cut mud.

The next set of perforations was at 10,507-526 ft., and the test run between 10,507-11,000 ft. The tool was open 1 hour and recovered 540 ft. of gas-cut mud. Operators then set plug at 10,550 ft., and acidized the last set of holes with 1,000 gal., and tested between 10,496-10,550 ft. In 1 hour the recovery was 810 ft. of gas-cut mud, plus 2,420 ft. of acid water. Perforations at 10,380-92 and 10,396-10,410 ft., and tested between 10,335-10,550 ft., recovered 1,350 ft. of gas-cut mud in an unspecified time.

Operators then plugged back to 10,050 ft. and perforated at 9,988-10,002 ft. The last reported test, between 9,963-10,050 ft., using 1,000 ft. of water cushion and open 1 hour, produced a slight blow for 10 minutes, then died. Recovery was 540 ft. of gas-cut mud. It was shut in to await orders.

In other areas wildcats were active. Barnsdall Oil Co. et al 1 Davis Brothers, 7-16n-4w, cored red silt and shale, with no shows, at 8,127-37 ft. in the Travis Peak. In Bienville Parish, Union Producing Co. and Pure Oil Co. 1 Nebo, 30-14n-5w, had the rig up and were laying fuel lines. The Texas Co. 1 F. J. Rambin, 23-11n-11w, De Soto Parish, was drilling at 6,401 ft. in the Travis Peak, topped at 6,318 ft. (driller's top). H. L. Hunt 2 Louisiana Delta, 1-4n-4e, was drilling below 8,121 ft. in the upper Cretaceous. In Natchitoches Parish, Continental Oil Co. 1 Pardee Co., 30-12n-6w, was drilling at 7,925 ft.

In Lincoln Parish, W. C. Feazel 1 C. C. Barham, 21-20n-3w, was drilling below 8,501 ft. in the Cotton Valley after coring several gas shows. Cores between 8,508-16 ft. recovered 5 ft. of hard sand with no odor, and 2 ft. of porous sand with good gas



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odor. Between 8,516-29 ft. the recovery was 9 ft. of porous sand with good gas odor. Between 8,576-91 ft. the recovery was 4½ ft. of shale, 6 ft. of Vaughan sand, and 3½ ft. of hard sand with good gas odor. Carter Oil Co. 1 Matthews, 22-18n-4w, was drilling in hard sand at 8,639 ft.

Arkansas operations reflect a continued seasonal slump. Among those reporting were: Rober W. O'Mears et al 1 T. F. Moody, 12-16s-22w, Columbia County, which is promising as a new discovery 3 miles east of Buckner field. A drill-stem test at 7,232-35 ft., open 4½ hours and flowing through ¼-in. chokes, recovered 2,000 ft. of oil, plus 3,500 ft. of salt water. Bottom-hole flowing pressure was 3,150 psi. Operators were to squeeze and reperforate in an effort to shut off the water. It had top of the Smackover at 7,216-18 ft., with porosity at 7,229 ft. Elevation is 305 ft.

Also in Columbia County, Peterson Drilling Co.'s semiwildcat, the 1 H. L. Curry, NE SW NE 5-16s-19w, had total depth at 3,369 ft. and was fishing drill pipe. In Hempstead County, El Capitan Oil Co. 1 A. R. Avery, 4-11s-23w, ran survey to 894 ft. and shut down for orders. It is projected to 2,500 ft. In Union County, Mulberry Oil Co. 1 J. E. Martin, 25-18s-15w, is still pumping, with no gage reported. Total depth is 2,160 ft. in the Nacatoch.

North Louisiana completions for the week were 23 oil, including 2 distillate, and 6 dry holes. Four of the failures were wildcats. Fourteen oil wells were completed in Caddo field. Fifteen new locations were reported during the week. By parish they were: LaSalle four, Concordia three, Union three, Caddo two, and one each in Madison, Tensas, and Winn. New work in Arkansas include one location each in Columbia, Miller and Union counties.

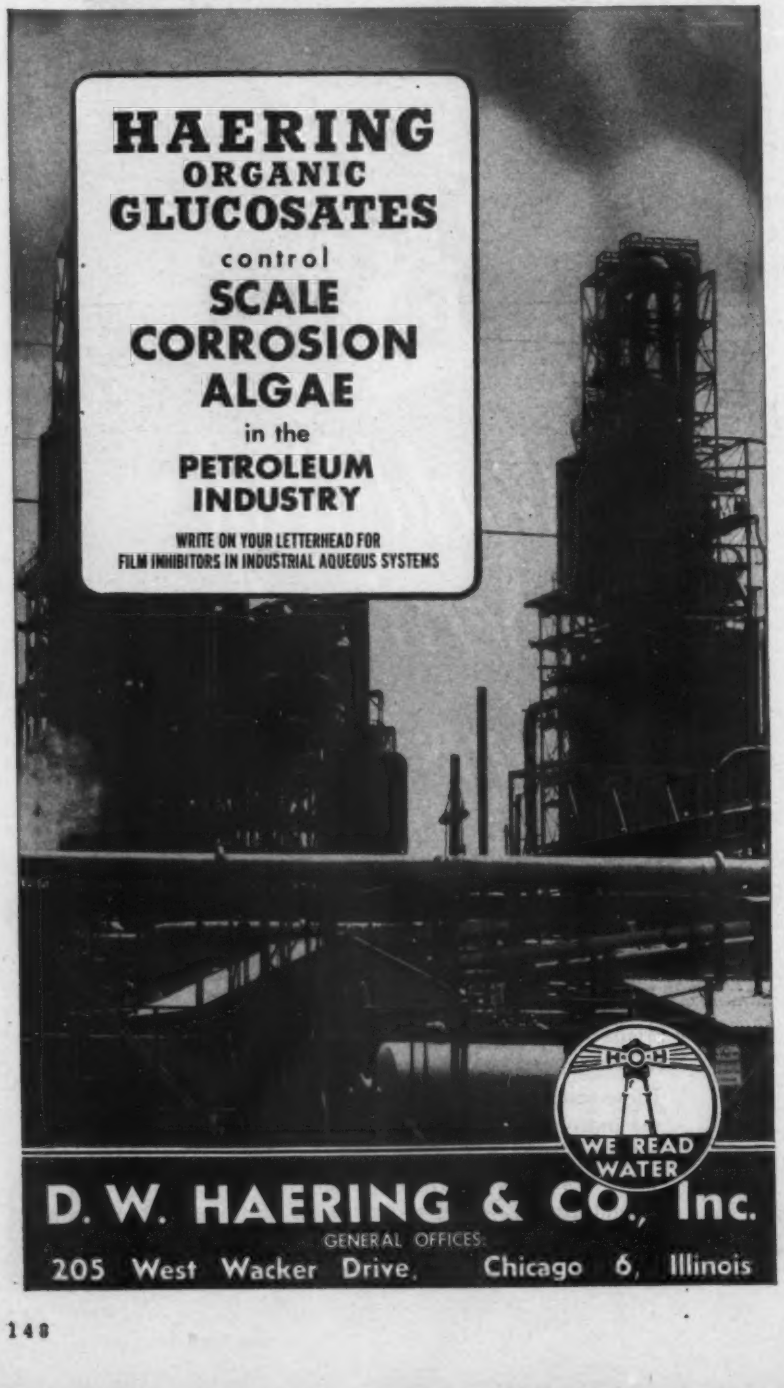
NORTH LOUISIANA WILDCAT FAILURES

Bienville Parish: Newton Oil Corp. 1 Long Bell Lbr., NE NE NE 33-15n-10w, dry, TD 2,964 ft., Saratoga 1,500 ft., Annona 1,750-1,860 ft., Austin 2,730 ft., Tuscaloosa 2,925 ft., elev. 297 ft.

Richland Parish: Big Chief Drilling Co. 1 J. C. Allen, NW NW NW 25-16n-7e, dry, TD 3,605 ft., Sparta 505 ft., Cane River 1,147 ft., Talahatta 1,282 ft., Wilcox 1,360 ft., Midway 2,370 ft., chalk 2,852 ft., Tuscaloosa 2,860 ft., lower Cretaceous 3,367 ft., elev. 84 ft.

Union Parish: Carter Oil Co. 1 G. H. Vaughn, NE NE NE 17-21n-1w, dry, TD 3,917 ft.

G. T. Hudson 1 J. W. Holloway, SE NE SW 23-23n-1w, dry, TD 2,547 ft.



OKLAHOMA

Fifth Pay Zone Indicated For Garden Grove Pool

THE Garden Grove Pool in Okfuskee County may have its fifth producing formation at the J. E. Crosbie 5 Schultz, NE NW SW 30-12n-7e. A 90-minute drill-stem test of the Skinner had a show of gas in 7 minutes and a recovery of 300 ft. of oil and 200 ft. of water. While the show is believed to be commercial, the operator will test the Hunton lime which was added as a fourth productive zone in the pool by the Sinclair Prairie Oil Co. 1 Sheets. A one-hour test of the Earlsboro was made at the 5 Schultz with a recovery of 30 ft. of oil and gas-cut mud. Other pays, in addition to the Hunton and Skinner, are Wewoka, Prue, and Earlsboro.

The Sholem Alchem field has been extended to the north by the Amerada Petroleum Corp. 1 Jack Harden, SW SW SW 36-1s-4w, Stephens County. A drill-stem test at 5,126-5,214 ft. recovered 2,300 ft. of 24° gravity oil and 90 ft. of oil and mud.

In the north end of the Witcher pool in Oklahoma County, the Amerada Petroleum Corp. 1 Jones, C SW SE 19-13n-2w, was perforated at 6,145-47 ft. and flowed 95 bbl. of 51° gravity distillate with 5,600,000 cu. ft. of gas in 21½ hours. The open flow was estimated at 40,000,000 cu. ft. per day.

In Grady County, the E. P. Halliburton 2 Goodwin, C SE NW 8-5n-8w, has extended Fortuna sand production a mile east from the Cement field. The well flowed 100 bbl. of oil from the Fortuna sand at 2,050-70 ft. through ¼-in. choke. Oil was 35.8° gravity.

Phillips Petroleum Co. 1 Eskridge, NE SW SW 18-4n-2w, McClain County, formerly a producer from the Bromide, was reworked to open Viola lime production on the north edge of the Southwest Wayne pool. The casing was perforated at 7,068-7,116 ft. and after an acid treatment, the well made 195 bbl. per day of 42° gravity oil.

OKLAHOMA SUCCESSFUL WILDCATS

Carter County: Sinclair 1 Tulsa University "B," NW SE SW 33-3n-2w, flowed 486 bbl. of 40.8°-gravity oil per day from Hunton at 6,675-6,805 ft., through a 28/64-in. tubing choke, TD 6,807 ft.

Garvin County: Sinclair 1 McDaniel-Ellison, C NE NW 12-4n-4w, flowed 1,246 bbl. of 52.3°-gravity distillate from McLish at 10,365-10,430 ft., TD.

Okfuskee County: Wilcox 2 Woodward, NE NW NE 13-12n-9e, pumped 52 bbl. of oil per day from Wilcox at 3,903-13 ft., TD 3,915 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Norman 1 Dowlin, NE SW SW 10-2s-10w, dry, TD 2,289 ft.

Garvin County: Sohio 1-B Kennedy, NW NW NE 26-1n-2w, dry, TD 7,905 ft., Basal Pontotoc-Arbuckle 7,040 ft.

Greer County: Winfrey 1 Baumgart, SW NW SW 15-5n-21w, dry, TD 1,025 ft.

Jefferson County: King 1 Saunders, SE NE NE 10-4s-8w, dry, TD 2,011 ft.

Noble County: Cities Service 1 Stockton, SW SE SE 18-23n-1w, dry, TD 5,128 ft., Skinner 4,330-40 ft., Bartlesville 4,416-28 ft. and 4,436-50 ft., Burgess 4,663-68

ft., Mississippi chat 4,668-7,724 ft., Mississippi lime 4.724 ft., Woodford 4.958 ft., Wilcox 5,038 ft., second Wilcox 5,093 ft.

Seminole County: Jackson 1 Adams, NW NW NW 21-6n-7e, dry, TD 1,455 ft., Calvin 1,450 ft.

H. E. R. 1 Grisco, SE SE SW 1-9n-6e, dry, TD 3,672 ft.

Previous Completions

Lincoln County: Johnson 1 Cobb, SW SW NW 30-15n-5e, dry, TD 3,718 ft.

Logan County: Baker 1 Ficken, C E/2 SW NE 8-19n-4w, dry, TD 6,443 ft., Foraker 2,139 ft., Topeka 2,943 ft., Oread 3,531 ft., Tonkawa 3,745 ft., Layton 4,617 ft., Hogshooter 4,772 ft., Checkerboard 5,055 ft., Oswego 5,279 ft., Mississippi lime 5,619 ft., Woodford shale 5,960 ft., Sylvan 6,030 ft., Viola 6,115 ft., Wilcox 6,320 ft., second Wilcox 6,359 ft.

KANSAS

East Berry Gets Lansing-Kansas City Production

THE East Berry pool in Rooks County had its first Lansing-Kansas City production with the completion of the Continental Oil Co. 2 Gilbert, NE NW SE 6-9s-18w. The well was drilled to the Arbuckle but made mostly water and was plugged back to 3,380 ft. Two sets of perforations were made at 3,330-62 ft. and 3,280-96 ft. and the well completed for a potential of 79 bbl. of oil plus 50 per cent water.

The Shell Oil Co. 1 Hendley, SE SE SW 7-24s-8e, is another attempt to extend the shoestring sand production that extends across the northwestern part of Greenwood County in the Scott, Teeter, Browning and Pixlee pools. Quite a few dry holes have been drilled in the past in attempts to extend this production into Butler County. The 1 Hendley is the first test by Shell on its recently acquired block that extends northeast from the area just east of El Dorado.

In the southeastern part of Barton County, casing has been set at the Gough Davis and El Dorado Refining Co. 1 DeWerff, NE SE SE 25-20s-12w, for a test of the Lansing-Kansas City. The well, located about ½ mile west of the Northwest Kowalsky pool, recovered 30 ft. of oil and 10 ft. of mud on a 15-minute drill-stem test from 3,176-79 ft.

The Madden pool in Ellis County has been reopened by the Jones-Shelburne 1 Madden "D," NE NW NW 26-15s-18w. Production is from the Lansing-Kansas City at 2,275-3,333 ft. On preliminary tests, the well was reported to have made 9 bbl. per hour for 8 hours.

The Skelly Oil Co. 1 Colburn, NW SE SE 4-33s-12w, Barber County, recovered both oil and gas on a drill-stem test of the Simpson. The well is located about 1½ miles east of the Northeast Medicine Lodge gas pool and about 2 miles northeast of the Boggs oil pool.

For the week, a total of 50 completions and 44 locations were recorded. Barton County led with 5 completions and 11 locations, followed by Butler with 5 completions and 9 locations, and Rooks with 7 completions and 1 location.

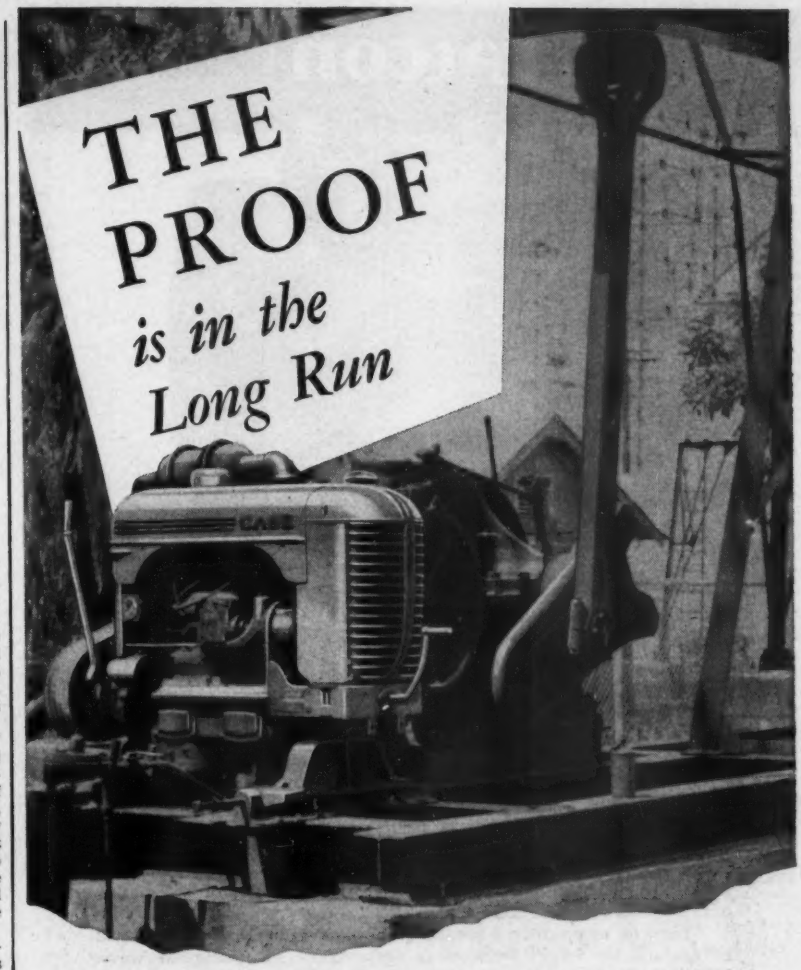
KANSAS WILDCAT FAILURES

Barton County: National Cooperative Refinery Association 1 Praeger, NE SE SE 3-18s11w, dry, TD 3,365 ft., Lansing 3,020 ft., conglomerate 3,304 ft.

Marion County: Saco Oil 1 Larsen, NW NW NW 13-21s-3e, dry, TD 2,787 ft., Mississippian 2,440 ft., Basal Mississippian 2,585 ft., Misener 2,738 ft., Hunton 2,745 ft.

Rooks County: C. U. Bay & Hinkle Oil Co. 1 Dickinson, NW NW NW 16-8s-18w, dry, TD 3,560 ft., anhydrite 1,373 ft., Kansas City 3,183 ft., Arbuckle 3,505 ft.

Seward County: Loffland et al 1 Light, SW SW NW 15-35s-32w, dry, TD 6,314



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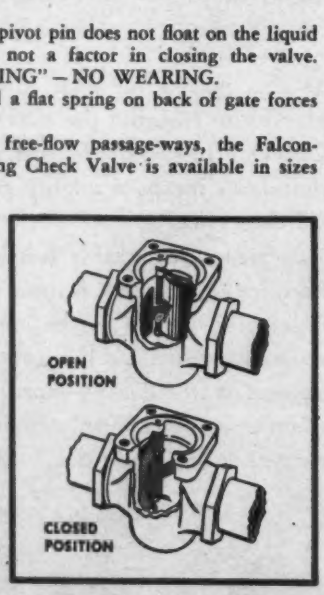

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ft., Herrington 2,670 ft., Krider 2,722 ft., Winfield 2,760 ft., Fort Riley 2,790 ft., Lansing 4,405 ft., Morrow sand 6,109 ft., Mississippian 6,174 ft.

Sumner County: Jack Bradley & Weller et al 1 Wedman, SW SW SE 23-34s-3w, dry, TD 4,808 ft., Stalnaker 3,172 ft., Kansas City 3,652 ft., Mississippian 4,320 ft., Kinderhook 4,686 ft., Viola 4,763 ft., Simpson shale 4,782 ft., Simpson sand 4,792 ft.

Aladdin Petroleum 1 Birkholz, NW NW NE 35-32s-4w, dry, TD 4,510 ft., Kansts City 3,282 ft., Basal Mississippian 4,240 ft., Simpson 4,324 ft., Arbuckle 4,433 ft.

SOUTHWEST TEXAS

New Gas Pool Opened In San Patricio

CORPUS CHRISTI.—In San Patricio County, approximately 1 mile west-southwest of West Sinton field, Arnold O. Morgan 1 W. S. Crabb has opened a new gas pool. On a 3-hour drill-stem test through perforations at 5,446-52 ft., using ¼-in. chokes, it flowed gas with a slight amount of oil and a little salt water. Working pressure 1,600 psi. Total depth is 7,485 ft., with 5½-in. casing set to 5,530 ft. This well is in the J. J. Welder & Coleman-Fulton Pasture Co., subdivision, in the George Morris Survey.

Peters Bros. 1-B W. R. Peters, in A. B. & M. Survey 175, extended oil production in East Peters field, Duval County, 1¼ mile south. Drilled to a total depth of 2,737 ft., with perforations at 2,600-08 ft., this well flowed on potential gage 26 bbl. of oil per day through a 3/16-in. choke, gas-oil ratio 191, tubing pressure 160 psi., casing pressure 700 psi., gravity 22°. Total depth is 2,373 ft., with production through perforations at 2,307-12 ft.

There were 29 new locations reported for Districts 1 and 4, of which 7 are wildcat starts, 2 in Frio, and 1 each in Duval, Hidalgo, Jim Wells, Nueces, and Travis counties. One successful exploratory test extended production at East Peters field in Duval County while 12 were dry, 2 each in Duval and San Patricio, and 1 each in Atascosa, Caldwell, Hidalgo, La Salle, McMullen, Nueces, Uvalde, and Zapata counties.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Duval County: Oil extension to East Peters field—Peters Bros. 1-B W. R. Peters, AB&M Sur. 175, 1¼ mi. S of previous production, top pay 2,600 ft., TD 2,737 ft., perf. 2,600-08 ft., IP 26 bbl. oil per day through a 3/16-in. choke, GOR 1,705, TP 210 psi., CP 400 psi., gravity 21°, trace of water. Comp. 1-15-48.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: H. A. Stahl 1 Stanush Est., in J. N. Seguin Sur., 4 mi. N of Jourdanton, dry, TD 1,882 ft.

Caldwell County: James H. Eddy & J. C. Foretich 2 John P. Williams, in Wm. J. Sneed Sur., 8 mi. NE of Luling townsite, dry, TD 3,826 ft.

Duval County: Argo Oil Corp. 1 Pauline Harter et al, in Brigido Flores Sur. 13, 13½ mi. N of San Diego, top Pettus 4,607 ft., dry, TD 5,719 ft.

Duval County: Bridwell Oil Co. 1 D. C. Hunter, in Jose Marcelo Ynojosa Gr., 6 mi. NE of Hebbronville, 8 mi. S of Conoco-Driscoll field, dry, TD 5,015 ft.

Hidalgo County: H. L. Hunt 1 M. I. Garza, in M. Guerra & Sons Est. Partition, San Salvador del Tule Gr., 10 mi. N of Faysville, dry, TD 8,019 ft.

LaSalle County: La Salle Oil Co. 1 R. M. Harriss, I&GN Sur. 42, 12 mi. E-NE of Cotulla, 1½ mi. NW of Los Angeles, dry, TD 6,931 ft.

McMullen County: H. S. Head et al 1 Wheeler & Wheeler, in Susan Skinner

Sur. 3, 8 mi. NW of Tilden, dry, TD 6,017 ft.

Nueces County: Selby-Walker Corp. 1 O. E. Arnim, in Sec. 30, Laureles farm trs., 9 mi. S of Corpus Christi, 5 mi. E of London field, and 6½ mi. W of Flour Bluff field, dry, TD 6,601 ft.

San Patricio County: Producers Corp. of Nevada 1 Hart Bros., Sec. 10, Geo. H. Paul's subd., Coleman-Fulton Pasture Lands, 2½ mi. SE of Sinton, dry, TD 6,514 ft.

San Patricio County: Stanolind Oil and Gas Co. 3 James F. Welder Hrs., O'Neill area, in V. Tares & P. Villareal Gr., 5 mi. E and S from Edroy, dry, TD 8,372 ft.

Uvalde County: Roger Lacy 1 Geo. A. Kennedy, in J. J. Guerra Sur. 75, 3½ mi. NE of Uvalde, dry, TD 277 ft.

Zapata County: O. W. Killam 1 Wroe, in Sur. 633, 6 mi. SW of Cuevitas, 3 mi. SE of Charco Redondo field, dry, TD 2,624 ft.

PERMIAN BASIN

Operators Coring Ahead on Coke County Test

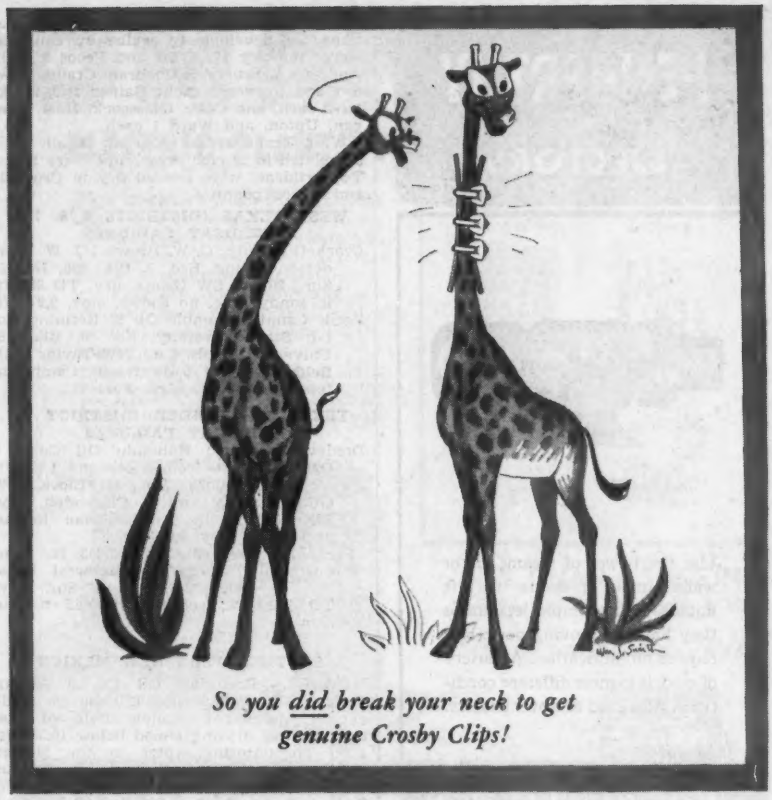
MIDLAND.—Sun Oil Co. ran its first drill-stem test in what is believed to be the Marble Falls section in its 2 J. W. Arledge, confirmation well in its northern Coke County field. The 1-hour test between 6,552-93 ft. recovered 190 ft. of gas-cut mud, but reported no oil shows. Tested through ½-in. bottom choke, and ¼-in. top opening, bottom-hole flowing pressure was 150 psi. Shutin pressure was 2,150 psi. Operators were coring ahead. On an elevation of 2,270 ft., the 2 Arledge is said to be running flat with the discovery, which had top of the limestone at 6,537 ft., and pay at 6,598 ft. Top of the Marble Falls in the second test is 6,603 ft.

Currently holding interest in West Texas, C. W. Chancellor, Slick Oil Co. et al 1 Thornton Davis, Pecos County wildcat 2 miles west of Pecos Valley, which reported a total of 853 ft. of possible gas-distillate pay section in the Ellenburger. Operators stopped to run casing to total depth of 9,741 ft. Operators decided to run pipe and test the bottom section after last week's drill-stem test recovered gas-cut mud and sulfur water. It entered saturated Ellenburger at 8,780 ft., and has logged the 853 ft. of pay zone above the water level, it was said. According to reports 5½-in. casing will be run to bottom and cemented to the top before perforations are made. Estimates on gas and distillate from the well run as high as 200,000,000 cu. ft. a day, plus 50 bbl. of distillate an hour. Location is 1,980 ft. from south and east lines of Section 105, Block 8, H&GN Survey.

Cities Service Oil Co. 1 Collins, Sterling County wildcat in Section 71, Block 17, SP Survey, 4 miles north and 2 miles west of Iolanthe, was swabbing approximately 30 per cent oil at 8,142-84 ft. At the start, it recovered 7.7 bbl. of oil and 92.9 bbl. of load and sulfur water in 14 hours of swabbing.

In Crockett County, Humble Oil & Refining Co. 2 Ethel C. Smith Estate, Section 13, Block AB, D&SE Survey, was a prospective extension well to the Childress Ellenburger pay when it recovered 450 ft. of 38°-gravity oil and 660 ft. of heavily oil and gas-cut mud on a drill-stem test from 8,108-30 ft. Gas came to the surface in 5 minutes, but was estimated at only 125,000 cu. ft. daily, which decreased to around 50,000 cu. ft. The tool was open 2 hours. Operators then drilled ahead and tested from packer at 8,130 to 8,145 ft.

New locations this week totaled 77, including 12 wildcats, compared with the previous week's 73 locations in proven areas and 6 wildcats. This week Hockley County led with three wildcat locations; Crockett County had two, and one each was reported for Andrews, Pecos, Reeves, Scurry, Tom



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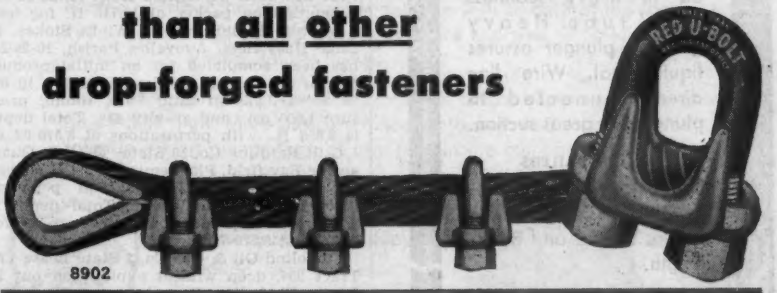

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Green, Sutton, and Upton counties. Locations for development wells, by counties, were: Hockley 17, Ector and Pecos 8 each, Andrews 6, Scurry 5; Cochran, Crane, Howard and Reeves 3 each; Gaines and Winkler 2 each, and Coke, Glasscock, Hale, Reagan, Upton, and Ward 1 each.

West Texas areas reported 42 oil wells completed in proven areas, and 4 dry holes. Two wildcats were finaled dry in Crockett and Pecos counties.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Crockett County: C. W. Brown 1 J. W. Henderson-Fitting, Sec. 8, Blk. 888, H&GN Sur., 20 mi. SW Ozona, dry, TD 986 ft. in sandy lime, no shows, elev. 2,271 ft.

Pecos County: Humble Oil & Refining Co. 1-L State-University, Sec. 5, Blk. 18, University Lands, 4 mi. NW Taylor Link field, dry, TD 5,640 ft. in Cambrian, topped 5,294 ft., elev. 2,524 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURES

Donlevey County: Honolulu Oil Corp. 1 Ozier, 2,310 ft. from north and 1,980 ft. from west lines, Sec. 55, Block C-6, GC&SF Sur., 1 mi. S Clarendon, dry, TD 5,893 ft. in pre-Cambrian topped at 5,857 ft., elev. 2,848 ft.

Honolulu Corp. 2 Ozier, 2,245 ft. from north and 2,172 ft. from west lines, Sec. 55, Block C-6, GC&SF Sur., dry, TD 1,325 ft.; acidized 1,200-25 ft., no shows.

SOUTHEASTERN NEW MEXICO

HOBBS. — Barnsdall Oil Co. 9 Alaska Cooper, NE NE 12-20s-36e, Ellenburger wildcat in Monument shallow field of Lea County, was drilling ahead below 10,360 ft. after encountering water in the McKee sand section. The McKee was topped at 10,304 ft., or 6,736 ft. below sea level, and drill-stem tested for 3¼ hours between 10,308-32 ft. It produced a slight blow of air at the first of the test, and recovered the 1,500-ft. water blanket, plus 630 ft. of muddy salt water and 6,020 ft. of salt water, with no shows of oil.

SOUTH LOUISIANA

Calcasieu Parish Well Continues to Test

NEW ORLEANS.—Sohio Petroleum Co. and General Crude Oil Co. 1-B Sweet Lake Land & Oil Co., wildcat in Section 30-10s-6w, in the Bell City area, approximately 2 miles southeast of production at Holmwood, Calcasieu Parish, continues to test for completion, now cleaning into pits. Pipe has been perforated from 10,736-50 ft., tubing set on packer at 10,718 ft. for test.

Atlantic Refining Co. 1 W. L. Stokes, in Dave Haas field, Avoyelles Parish, 10-2s-2e, has been completed for an initial production of 211 bbl. oil per day through a 10/64-in. choke, gas-oil ratio 1,070, tubing pressure 1,500 psi., and gravity 43°. Total depth is 8,656 ft., with perforations at 8,570-82 ft.

Gulf Refining Co. 59 State "QQ," in Quarantine Bay field, Plaquemines Parish, flowed on potential test 276 bbl. oil per day through a 10/64-in. choke. Total depth is 9,200 ft., and production is through perforations at 8,670-76 ft.

Stanolind Oil & Gas Co. 2 State Lease 739, Tract 884, deep wildcat exploration out in South Timbalier Bay, between Timbalier Bay and Caillou Island fields, Lafourche Parish, is at a total depth of 14,147 ft. where it fishes for lost drill pipe.

The Texas Co. 4 State-Barataria, Lease 346, wildcat in Queen Bess Island field area, Jefferson Parish, continues to drill below 15,552 ft. Protective string of 8⅝-in. pipe has been cemented at 12,037 ft.

Kerr-McGee Oil Industries, Inc., 1 State Lease 750, Block 28, in Ship Shoal area, 12 miles northwesterly from Old Coon Point Prospect, 7½ miles south of shore line, Terrebonne Parish, set 9⅝-in. protection string at 7,092 ft. and operators are drilling ahead.

There were 11 new locations reported this week, 2 of which are wildcat starts, 1 each in Beauregard and Orleans parishes. One wildcat failure was reported in Cameron Parish. Three oil wells in proven areas were completed.

SOUTH LOUISIANA WILDCAT FAILURE

Cameron Parish: The Texas Co. 1 State-Willow Bayou Lease 790, in Sabine Lake, twp. 14s-15w, dry, TD 12,285 ft.

MISSISSIPPI

New Shallow Piercement Indicated in Kole Area

JACKSON.—Humble Oil & Refining Co. 1 Zula L. Daughtry, in the Kola area, Covington County, 28-8n-15w, has cored Cap Rock and anhydrite to indicate a new shallow piercement dome. Ran electric log to 2,365 ft.; tops: Cook Mountain 1,370 ft., Sparta 1,660 ft., Cap Rock 2,227 ft., anhydrite 2,325 ft. Cored from 2,366-2,406 ft., anhydrite with show of dead oil in fractures; cored from 2,406-56 ft., anhydrite with no shows. Operators are now coring below 2,456 ft.

In Brookhaven field of Lincoln County, Roeser & Pendleton 1 A. Brewer, 10-7n-7e, has been completed for an initial production of 126 bbl. of 34.5°-gravity oil per day on pump. Total depth is 10,450 ft., with production through perforations at 10,392-420 ft.

The California Co. 1 Millard Smith et al, 7-6n-8e, in Mallalieu field of Lincoln County, flowed on potential test 1,149 bbl. of 37-9°-gravity oil 24 hours, 18 hours through a ½-in. tubing choke and 6 hours through

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¼-in. tubing choke, tubing pressure 560 psi., ratio 650. Perforations are from 10,413-25 ft., and 10,441-70 ft.

Two wildcat starts were reported this week, one each in Hinds and Marion counties, while three development locations were shown, one each for Baxterville field, Marion County; La Grange field, Adams County; and Mallalieu field, Lincoln County.

OHIO, KENTUCKY

Gas Struck Near Big Gillogly Well

COLUMBUS.—Wasson Co. struck gas in a test 1½ miles south of the big Gillogly well in Blue Rock Township, Muskingum County. Top of the Clinton sand was found at 4,385 ft. and the well drilled to 4,416 ft., still in sand, where the open flow was 3,500,000 cu. ft. natural. The well was located on Elmer Abele, Section 14.

Glenn Harmon et al moved ½ mile west of the 1 Sprinkle and drilled in a 980,000-cu. ft. natural well on V. W. Dilgard, Section 18, Jackson Township, Ashland County. Clinton sand was reported at 2,907-12 ft.

Ohio Fuel Gas Co. 4 E. R. McConnell, Lot 124, Pittsfield Township, Lorain County, extended Pittsfield pool a location to the west. Clinton sand at 2,191-2,200 ft. gaged 1,600,000 cu. ft. natural.

Independent operators are still active in Perry County, and completed a number of good wells last week. In Bearfield Township, Fred Beasley et al 1-C Nicholas Altier, Section 34, topped the Medina sand at 3,908 ft. and was drilled 5 ft. in where the gage was 2,565,000 cu. ft. natural. National Gas & Oil Co. 9 E. E. Thompson, Section 24, Hopewell Township, drilled through the Clinton sand at 3,074-3,108 ft. with 431,000 cu. ft. natural, and an estimated 1,000,000 cu. ft. when shut in after shot. In Madison Township, Clinton Oil Co. shot the 1 Myrtie Forsythe with 125 qt., and in 24 hours the well flowed 120 bbl. The natural production was 40 bbl. with 800,000 cu. ft. gas from the Clinton at 3,274-3,333 ft.

In the same township, Mid East Oil Co. 1 Fred Beem, Section 21, reached the Clinton at 3,229 ft. and drilled to 3,276 ft., still in sand, where the well showed 1,500,000 cu. ft. natural.

New locations are back up again to nearly normal with 25 this week. Six were in Muskingum County, three each in Knox, Perry, and Meigs counties, and two each in Licking and Medina. Lancaster field led in completions with 5 out of a total of 16.

OHIO WILDCAT FAILURES

Muskingum County, Blue Rock Township: National Gas & Oil 1 Ellsworth Crawford, Sec. 11; Trenton 5,993-6,740 ft., St. Peter 6,775-97 ft., TD 6,797 ft.

Jackson Township: National Gas & Oil 1 Lyman Ewan, Sec. 22; Clinton 3,326-90 ft., TD 3,400 ft.

WESTERN KENTUCKY

OWENSBORO.—Daviess County had a good completion last week in the Sohio Petroleum and W. E. Hupp 1 F. R. French, 10-P-27, Panther pool. The well was completed in the O'Hara at 1,811-16 ft. for an initial production of 146 bbl. per day. Well was acidized with 3,000 gal.

In Logan County the S. W. Mitchel 3 B. Wagoner, 21-G-31, has been completed in the McClosky at 583-86 ft. for an initial pumping production of 110 bbl. per day.

INDIANA

EVANSVILLE.—The Stephen P. Laylor 1 Catt Heirs, SE NE NE 15-1n-9w, Pike County, shows good prospects for opening a new area between the Union-Bowman field and the northern county line. Operator has reset casing to test the Jackson sand after getting 350 ft. of oil in 2½ hours.

In Gibson County the Superior Oil 1 Levi

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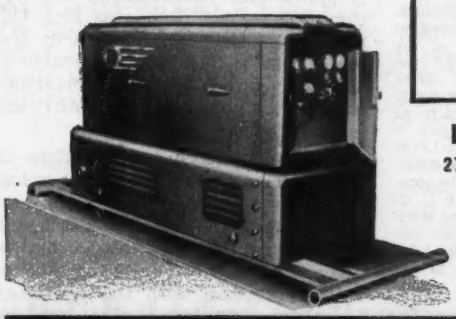

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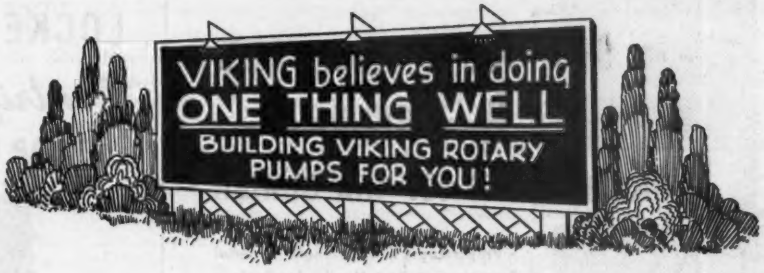

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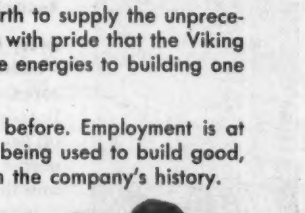


See Our Catalog in SWEETS

Viking PUMP COMPANY
Cedar Falls, Iowa

Tucker, NW NW SW 4-3s-11w, will be put on pump to test the Benoist at 2,223-34 ft. after a 60-qt. shot.

The George & Wrather 3 Kieffer "A," SW NW SW 25-1s-12w, has been completed in the Cypress at 1,950-71 ft. for an initial pumping production of 150 bbl. per day.

INDIANA WILDCAT FAILURES

Miami County: Palmer & Hoyt 1 L. A. Chartairs, SE SE SW 29-27n-4e, dry, TD 911 ft.

Madison County: L. T. Birkheimer 1 B. Dorsey, SE SE SW 29-6n-8w, dry, TD 1,250 ft.

Jefferson County: Joe Reznik 1 E. P. Sargent, SW NE NW 1-2s-2e, dry, TD 2,771 ft.

Gallatin County: C. E. Brehm 1 L. E. Edwards, SE SW SW 10-8s-8e, dry, TD 2,206 ft.

Calvert & Willis 1 A. Bowling, SE NW NE 26-8s-9e, dry, TD 2,968 ft.

ILLINOIS

Wabash County Pool Gets New Pay

THE Gilliam Drilling Co. 2 G. Seitz et al, W½ NW SE 23-1s-13w, Wabash County, opens a new pay in a field discovered in January 1948. On a drill-stem test of the McClosky, 2,600-06 ft., the well had gas in 5 minutes and a flow of natural oil in 18 minutes. A test of the Benoist at 2,491-99 ft. got 60 ft. of oil-cut mud and 70 ft. of salty mud. The 2 Sietz opens a new pay in the pool discovered by the 1 Seitz in January, producing from the Cypress sand.

Wayne County had two good wells completed last week. The A. J. Slagter 6 L. C. Jordan "B," NW NE NW 34-2n-7e, was completed in the Aux Vases for 160 bbl. per day. The Don Slape 3 T. R. Michels "A," NE NE SW 26-2n-7e, was completed in the Aux Vases, 2,938-56 ft., for an initial pumping production of 116 bbl. per day.

ILLINOIS WILDCAT FAILURES

Douglas County: E. Landon 1 D. H. Bariether, SE NE SE 24-15n-8e, dry, TD 564 ft.

Report Presents Selected Values for Hydrocarbons

WASHINGTON.—Accurate selected values of the fundamental physical constants and properties of a large number of hydrocarbons have been compiled and published by the National Bureau of Standards in a 496-page bound volume, released as Bureau Circular C461 and obtainable at $2.75 per copy from the Superintendent of Documents, Government Printing Office.

Because research investigations in the petroleum, rubber and chemical industries depend greatly upon fundamental data on the physical and thermodynamic properties of hydrocarbons, the bureau initiated a cooperative program with the American Petroleum Institute in 1941 for the compilation of tables of selected values of these properties.

In addition to fundamental constants, conversion factors, useful equations and molecular weights, the tables include data on boiling point, pressure coefficient of the boiling point, freezing point, specific gravity, refractive index, molecular volume, molecular and specific refraction, specific dispersion, refractivity intercept, viscosity, vapor pressures, equilibrium constant of formation, theremodynamic properties, cryoscopic constants and heat of fusion.

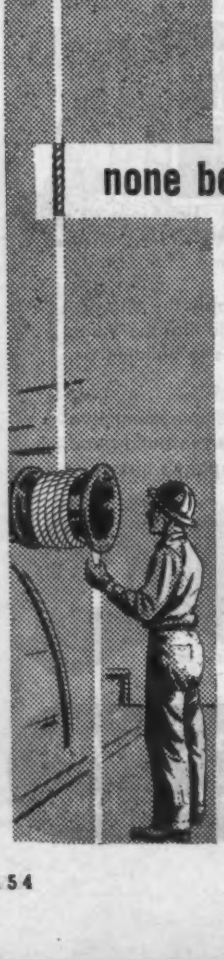
Navy Buys Surplus Oil Terminal at Jacksonville

The Navy Department has purchased the surplus oil terminal at Jacksonville, Fla., from War Assets Administration for $268,664.

WAA was unsuccessful in its efforts to dispose of the property to private enterprises who were not interested in acquiring the property in its entirety for on-site use.

Among facilities included on the 228-acre site were two 55,000-bbl. and two 80,000-bbl. oil-storage tanks with suction heaters and suction lines capable of handling 25,000 bbl. of oil per day.

The terminal's frontage of about 5,500 ft. is in shallow water on the St. Johns River.



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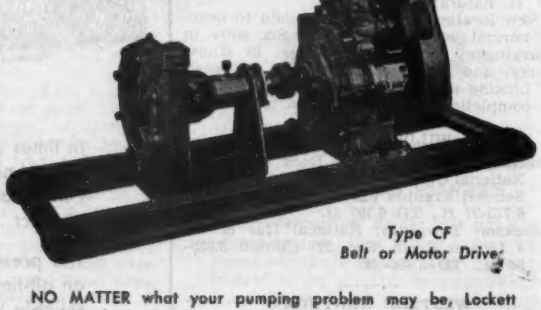

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NEW ORLEANS HOUSTON DALLAS

Informed Public Needed, Jennings Tells Texans

(Continued from page 59)

vancing technology but here, too, well over half of the equipment in use today was constructed 5 to 20 years ago. Because so few bulk plants and retail outlets have been built in recent years the marketing branch of the industry probably has over 90 per cent of its plant on the books at prewar figures.

"To the extent that a company is setting aside funds for depreciation and depletion which are insufficient to replace wornout facilities, it is obvious that the company is losing ground, or stated differently, that its earnings, as reported, are more than its actual earnings. The importance of this factor is greater than is generally realized. For example, 30 of the largest oil companies had in 1947 estimated earnings of one billion two hundred million dollars after depreciation and depletion reserves of eight hundred million dollars. Last year differed from previous years in that normally reserves are just about equal to net earnings. Now, if because of higher replacement costs, these 1947 reserves were only two-thirds of what they should have been to keep even with wearing out of plant, then reported earnings exceeded true earnings by $400,000,000. I do not say that reserves are exactly two-thirds of what is necessary to maintain properties at today's costs, but I believe that the figure is conservative.

"All industry is affected similarly by inflation but the oil industry more so than most. This is so because investment in the oil industry is very high in relation to sales, and profits are modest in relation to sales. Therefore, any appreciable change in the calculation of depreciation reserves has a very pronounced effect on true earnings.

More Oil Must Be Found

"So much for the bookkeeping problem resulting from inflation. There is another problem facing the oil business. It is the urgent need that, in the national and public interest and almost regardless of cost, everything possible be done to increase the supply of oil. Military security, growth of population, increasing standards of living, all dictate that this must be done. For years the growth in demand for petroleum has been about 4 per cent annually, and over the past the industry adapted itself pretty well to that rate of growth. From time to time, it went to the public for new capital but for the most part it was able to finance its physical expansion program by retaining a goodly proportion of earnings.

"Now, oil burners, diesel locomotives, farm machinery, airplanes and our old friend, the automobile, have caused us to increase supply by 39 per cent since 1941, and the rate of growth in 1947 appears to have been about 11 per cent per year. In short, we are being told by our customers, 'we like oil better than other fuels, we are going to travel more in our automobiles, on these new streamliners and airplanes, so you must expand twice as fast as you used to. Sure, it may cost you two or three times as much to drill an oil well or build a refinery but that is your problem; and we expect you to do all of this and furnish us products at reasonable prices, just as you always have.'

"I think there is a lot in what the public wants us to do, and I think, too, that it is up to us to make good. On the other hand, the impossible takes a little time to do, and certainly it is not too much to ask our customers to give us that time.

Oil's Problem Different

"The problem of too much business is certainly new to the oil industry. Its solution is necessarily different from that of the ordinary industry. This is so because the oil industry's raw material is 'discovered' and not merely manufactured. The problem cannot be solved by simply putting up another factory.

"I believe that if they can be made to understand the facts, the public will be reasonable, just as we are with our friends in the steel plants or our friends in other lines who have supply-demand problems. The job we have, apart from stepping up the output, is to explain to those who are not in day-to-day touch with the oil business, what we are up against, why we have to get more money for our products and why, for several years anyway, we are going to have to earn a lot more of those inflation dollars to do the job.

"It is not an easy task to explain all of the why's, but it's a job that must be done. It must be done by all of us—individually in our own communities, among our employes and stockholders and customers. It is important and extremely timely that all of us do what we can to explain this industry to as many people as possible. When that is done, we can hope to continue operating competitively, free of control and interference."

Oil Industry in Southwest Working at Capacity Level, Committee Report Shows

HOUSTON.—A summary of operations of the petroleum industry in the Southwest by the District 3 committee of the National Petroleum Council shows that the producing, refining and transportation branches are now working at a capacity level which is about 15 per cent above the peak of World War II.

In the six-state district of New Mexico, Texas, Louisiana, Arkansas, Mississippi, Alabama, crude runs to stills are averaging about 2,100,000 bbl. daily, the committee reported, and kerosine and distillate fuel oil yields have increased 16 and 37 per cent respectively.

Crude-oil production in the district is about 16 per cent higher than the greatest wartime output. Production is averaging more than 3,491,000 bbl. daily, some 60 per cent of the total United States supply.

The committee said pipe-line transportation throughout the district is now adequate with the exception of West Texas where about 112,000 bbl. daily of crude is now being moved by tank car. Additional pipe-line capacity into this section of 300,000 bbl. daily is now being constructed to remedy this situation, but because of delays in pipe deliveries completion of all the lines is not expected this year. Operation of these new lines will make available a large number of tank cars for products movement.

The tanker shortage has been overcome, the committee said, and recently tankers have been awaiting cargoes. Practically all inland water and tow equipment available is now in use.

The committee is headed by John W. Newton, Beaumont, Magnolia Petroleum Co. vice president. Reports on the industry operations in the district were compiled by several subcommittees named a few weeks ago.

Alford Allowable Hearing To Be March 18

AUSTIN.—A hearing on allowing the Slick-Urschel Oil Co. 1 Alford in Upton County, West Texas, to continue production at 500 bbl. daily has been scheduled for March 18 by the Texas Railroad Commission.

The Alford well, which has been considered probably the most important oil strike in 1947, is producing from near 12,000 ft. *(The Oil and Gas Journal, February 5, page 60.)* Two other wells are being drilled in the area.

Concurrently with the hearing the commission will take testimony on the maximum efficient rate of production for the new Benedum field, opened by the Slick-Urschel discovery.

STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 6, 1948

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1948				
	Comp.	Oil	Gas	Dry	Footage	1948	1947	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	24	12	0	*12	24,705	290	264	0	0	0	0	0	0	0	0	0	0
Pennsylvania	43	20	4	†19	73,856	540	613	0	0	1	0	1	0	0	2	10	12
West Virginia	15	1	9	5	41,355	134	165	0	0	0	2	2	0	0	11	15	26
Ohio	17	6	3	‡8	56,175	200	224	0	0	0	2	2	1	0	2	7	10
Indiana	20	7	3	10	27,245	176	72	0	0	0	1	1	1	0	0	2	3
Kentucky	8	5	0	3	7,836	118	71	0	0	0	0	0	1	0	0	3	4
Illinois	29	14	0	15	70,489	381	354	0	0	0	5	5	8	0	0	64	72
Michigan	8	3	0	5	17,966	133	122	0	0	0	4	4	5	0	3	52	60
Kansas	50	28	5	‡17	162,397	514	504	0	0	0	6	6	7	0	1	62	70
Neb., Mo., Iowa	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Oklahoma	64	44	4	16	221,826	§679	766	2	1	0	9	12	23	1	6	117	147
Texas	192	122	8	62	842,036	1,868	1,477	7	0	1	29	37	59	5	15	347	426
North Central (Dist. 7-B & 9)	65	29	5	31	187,168	556	468	2	0	1	6	9	24	0	3	112	139
West (Dist. 7-B & 8)	48	42	0	6	227,759	491	374	0	0	0	2	2	9	0	0	32	41
Panhandle (Dist. 10)	11	7	2	2	34,843	104	84	0	0	0	2	2	0	0	1	2	3
Eastern (Dist. 5 & 6)	11	11	0	0	67,567	103	88	0	0	0	0	0	3	0	0	30	33
Gulf Coast (Dist. 2 & 3)	31	20	1	10	193,731	308	279	4	0	0	7	11	16	4	3	79	102
Southwest (Dist. 1 & 4)	26	13	0	13	130,968	306	184	1	0	0	12	13	7	1	8	92	108
Louisiana	37	26	0	11	139,061	329	207	0	0	0	5	5	7	3	1	30	41
Northern	29	23	0	6	77,445	215	96	0	0	0	4	4	0	0	0	17	17
Southern	8	3	0	5	61,616	114	111	0	0	0	1	1	7	3	1	13	24
Arkansas	0	0	0	0	0	67	38	0	0	0	0	0	1	0	0	18	19
Mississippi	5	2	0	3	56,160	75	65	0	0	0	0	0	2	0	0	14	16
Southeastern States	0	0	0	0	0	7	10	0	0	0	0	0	0	0	0	6	6
Montana	8	5	0	3	18,957	47	30	0	0	0	0	0	1	0	0	7	8
Wyoming	6	4	0	2	24,111	69	44	0	0	0	1	1	3	0	0	7	10
Colorado-Utah	6	4	0	2	40,207	53	27	0	0	0	2	2	0	0	0	9	9
New Mexico	10	8	0	2	43,528	107	92	0	0	0	0	0	2	0	0	4	6
California	49	44	2	3	148,299	496	376	2	0	0	3	5	5	0	0	52	57
Total United States	591	355	38	198	2,016,209	6,283	5,522	11	1	2	69	83	126	9	41	826	1,002
Total previous week§	572	323	44	205	2,033,526	5,692	4,945	11	1	4	75	91	115	8	39	757	919
Total March 8, 1947	575	334	67	174	2,072,735			14	4	1	66	85	109	13	25	704	851

Service wells included: *12, †17, ‡1. §Revised.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$2.17	....	....	....
19-19.9	2.19	....	....	....
20-20.9	2.21	$2.25	....	$2.12
21-21.9	2.23	2.27	....	2.14
22-22.9	2.27	2.29	....	2.16
23-23.9	2.30	2.31	....	2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED FEBRUARY 28

District—	Crude runs, daily avg.	Production (Thousands of barrels) Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	852	1,949	474	1,421	1,499	22,295	3,725	7,671	7,190
Appalachian:									
District 1	103	320	73	96	81	2,161	174	398	303
District 2	79	235	25	88	112	1,213	104	226	117
Ind., Ill., Ky.	842	2,871	477	1,000	1,155	20,419	1,601	3,983	3,639
Okla., Kans., Mo.	444	1,466	177	574	529	10,686	482	1,941	1,396
Inland Texas	240	1,021	91	186	470	4,208	192	315	887
Texas Gulf Coast	1,379	3,628	848	2,472	1,745	20,348	1,191	5,363	5,817
La. Gulf Coast	437	1,151	386	827	608	6,200	943	1,834	1,757
N. La. and Ark.	66	160	55	87	100	2,397	223	302	197
Rocky Mountain:									
New Mexico	12	29	4	10	23	114	25	16	30
Other Rocky Mtn.	150	463	30	152	345	3,096	108	640	733
California	859	2,503	140	1,050	2,157	17,903	826	11,147	2,140
Feb. 28, 1948	5,463	15,796	2,780	7,963	8,824	111,040	9,594	33,836	49,206
Feb. 21, 1948	5,399	15,807	2,520	8,127	9,199	109,886	9,731	34,004	49,782
March 1, 1947	4,895	14,173	2,193	5,444	8,933	103,672	11,493	36,901	44,270

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 220,507,000 bbl. as of February 28—up 1,193,000 bbl. One year ago 225,131,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas	$2.65
Kettleman Hills, California*	2.14
Beauregard Parish	2.56
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	5.00
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

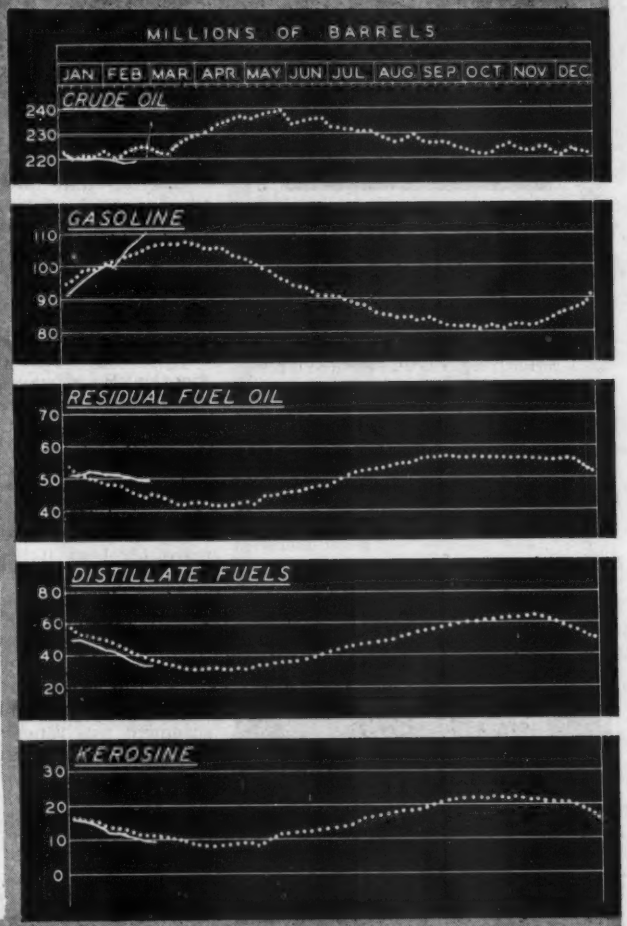
	Mar. 6 crude oil	B. of M. Feb. demand	Feb. 28 crude oil
Alabama	1,300	1,500	1,300
Arkansas	86,750	82,000	86,650
California	934,600	930,000	936,100
Colorado	46,470	47,000	47,300
Eastern	66,250	64,900	64,970
Florida	775	1,000	775
Illinois	174,000	182,000	174,300
Indiana	18,300	16,000	17,600
Kansas	291,450	305,000	299,000
Kentucky	26,300	26,000	26,400
Louisiana	476,550	465,000	475,650
North Louisiana	122,900	.....	122,400
South Louisiana	353,650	.....	353,250
Michigan	44,750	45,000	47,300
Mississippi	113,910	112,000	119,475
Montana	22,910	24,000	24,680
Nebraska	500	600	500
New Mexico	128,950	125,000	125,000
Oklahoma	409,100	410,000	408,950
Texas	2,400,675	2,360,000	2,432,825
Dist. 1 (Southwest)	25,475	.....	25,700
Dist. 2 (Southwest)	170,350	.....	172,100
Dist. 4 (Southwest)	253,200	.....	254,675
Dist. 3 (Gulf Coast)	491,350	.....	498,450
Dist. 5 (Eastern)	43,350	.....	44,325
Dist. 6 (Eastern)	121,225	.....	122,500
East Texas Field	323,000	.....	315,000
Dist. 7-C (West)	43,850	.....	44,350
Dist. 8 (West)	666,700	.....	678,850
Dist. 7-B (W. Central)	43,100	.....	45,100
Dist. 9 (N. Central)	135,675	.....	145,425
Dist. 10 (Panhandle)	83,400	.....	86,350
Wyoming	136,080	134,000	137,850
Total United States	*5,379,620	5,331,000	5,426,625
Change from prev. wk., dn.	47,005		

Total production January 1-March 6 ..... †357,122,395 bbl.
Same period last year (crude plus cond.).. 313,337,440 bbl.

*Not incl. 52,275 bbl. condensate. †Incl. 3,296,305 bbl. condensate.

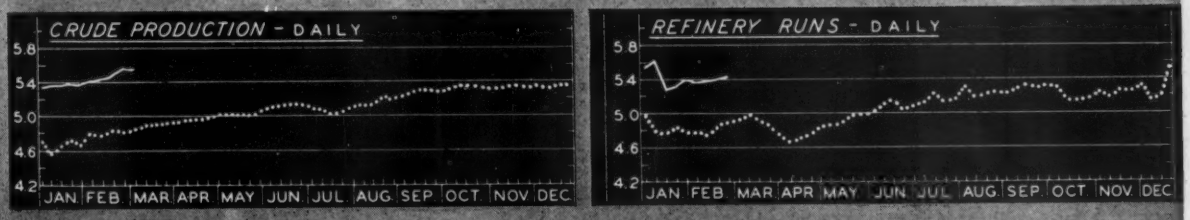
STOCKS IN UNITED STATES

---- 1947 ——— 1948



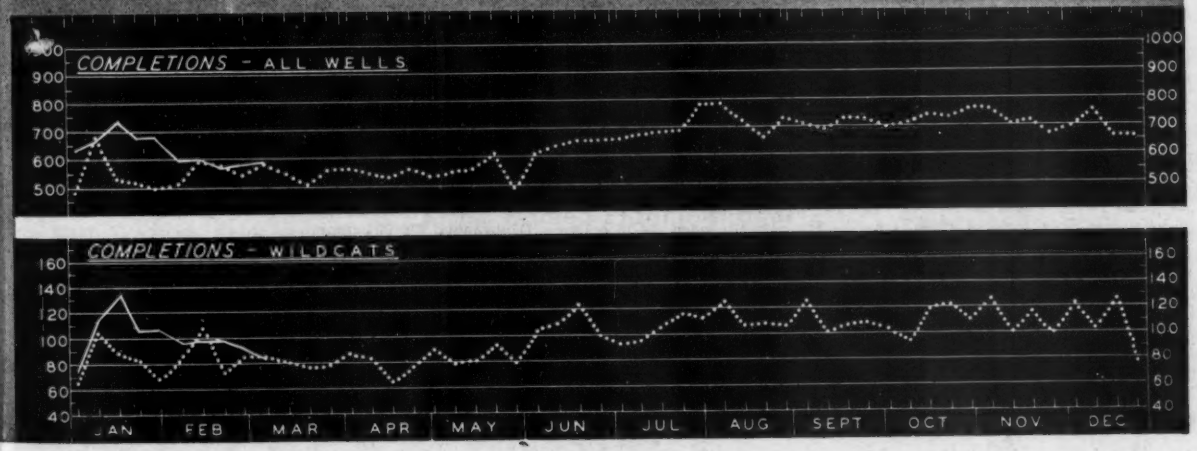
DAILY OPERATIONS

---- 1947 ——— 1948



WEEKLY COMPLETIONS

---- 1947 ——— 1948



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See Booths 89, 90, 121, 122
KEROTEST
OKLAHOMA BUILDING

MARKETS

A DROPPING off in demand for No. 2 burning oils was noted in the Mid-Continent area during the past week, according to some suppliers. The slackening off in demand, however, made no change in the price levels of that product. Shipments were quoted as moving at "around 14 cents" and as high as 14¼ cents per gallon.

Although a decrease in demand for No. 2 is already evident, one marketer said that he expected to see little, if any, change in price for that product during the coming summer months. He attributed this relatively strong demand to the continued use of the fuel by large numbers of industrial users who have been "pinched" for supplies during the period of short supply. A building up of storage supplies during the off-season also will help to keep the price level at its current place, he said.

Gasoline Demand Strong

Gasoline demand in the Mid-Continent remained fairly strong despite the colder weather that spread over most of the area in the past week. One shipment was reported at as high as 16 cents, although unconfirmed. Most shipments of housebrand gasoline were moving "at around 14 cents" with a few shipments bringing better than this. Nearly all movements were in buyer's cars.

One supplier said that he did not expect an increase in gasoline prices with the coming summer season unless there was an "extreme shortage," and he said that although the product would be tight the general supply problem would be less of a difficulty than has been the case of No. 2 over the recent critical months.

Several suppliers felt the transportation situation would ease considerably this summer because of better weather, an increase in available pipe-line facilities, and a general loosening up in the tank-car situation. But the present tank-car situation remains extremely tight.

Independent marketing sources in Houston said last week that the spot market in products appears to be nearing "dead center" in a changeover from burning oil to gasoline demand. There were reports that the premium prices heretofore paid for open-market material are beginning to sag.

"Distress" Material Moved

One source used the term "distress material" to describe a shipment of premium-grade motor fuel which was moved at 12 cents. Regular-grade motor fuel was being offered in East Texas for 12 cents. Some No. 2 was reported available at 11½ cents.

Increasing softness was shown in demand for No. 6 industrial fuel oil. For cargo material $3.25 was reported to be the top price, while tank-car shipments were moving considerably lower. Demand for No. 6 was said to be dropping throughout the Midwest.

In New York Harbor spot prices for heating oil and kerosine stiffened somewhat late last week. No. 2 was being largely quoted at 15.5 cents per gallon compared with 14.5 cents 2 days earlier. The reason was reported to be due to terminal buyers' stocks getting low. However, very little No. 2 and kerosine were available at any price.

At distributor levels, most dealers were still holding prices firm and waiting for a definite easing in supply before making any changes.

Representative Quotations

Representative spot-market quotations of leading suppliers as of March 8, 1948. Figures are f.o.b. plant for tank-car shipment in cents per gallon except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10½-11½	11.6-12* 10.5-12.2†	10.9-12.5
Premium gasoline, 78-80 octane	11¾-12½	10.6-13.4	12.9-13
42-44 w.w. kerosine	10-10½	10.2-12.2	10¼-12.5
No. 2 straw fuel oil	9½-11	9.3-11.1	9.05-12
No. 6 residual	$2.50-3.20	$3.03-3.90	$2.56-3.25

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9.9

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	13-14.5
750 vis., No. 3-4 neutral	15-17.25
2,000 No. 5-6 neutral	17-18½

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	30-3
200 vis. No. 3 neutral, 0-10 pp.	20-2

Western Pennsylvania

145-155 vis. 10 p.t. br ght stock	47
180 vis. p.t. neutra	45

CRUDE-SCALE WAX
Mid-Continent

130-132 A.S.T.M. melting point	8½-8¾

EQUIPMENT MEN ... in the News

Goodyear To Hold Sales Conferences

Annual sales-engineering conferences of Goodyear Tire & Rubber Co.'s mechanical goods division will be held in April at Lincoln, Neb., and New York City.

A 4-day conference, beginning April 6, will be held at the Cornhusker Hotel for the company's district sales managers and field representatives in the western division. One day will be devoted to inspecting production operations at Goodyear's belt plant in Lincoln. The New York meetings are to be held April 21, 22, and 23 at the Park Central Hotel for salesmen of the eastern division.

Approximately 150 salesmen will attend the conferences, including 30 executives and department heads from Akron.

Akron executives will review with the field staffs the latest data on product design and development of conveyor belts, V-belts, hose, molded goods, and other industrial rubber products.

Burris Joins A-1 Bit & Tool

J. J. BURRIS

J. J. (Joe) Burris has joined A-1 Bit & Tool Co. as consultant on the Burris key seat wiper, which tool was recently acquired by that company for manufacture, sales and service throughout the world. Burris was educated at Annapolis, but forsook the Naval Academy to enter the oil fields. Employed by A. W. Peake, now president of Standard Oil Co. (Ind.), but then general superintendent for Midwest Refining Co., Burris worked as roustabout, tool dresser, and roughneck in Salt Creek field in Wyoming from 1927 to 1934.

After the absorption of Midwest Refining Co. by the Stanolind Oil & Gas Co., Burris was transferred to East Texas as field foreman for the latter company, thence to the Texas Gulf Coast as district superintendent of Southwest Texas, having charge of drilling, production, and gasoline plants.

He left Stanolind in 1945 and developed the idea for the key seat wiper. Then followed a period of pioneering and proving which culminated in the development of a needed tool for the drilling industry.

Outstanding recent applications of the Burris key seat wiper has been in Sugar Valley field, adjacent to Bay City, Tex., where key seat troubles presented a difficult drilling problem.

Kobe Promotes Cooper

J. C. Cooper was recently promoted to district manager for Kobe, Inc., in the Rocky Mountain district, where he has acted as district representative in sole charge of operations since July 1946. Cooper attended Texas Tech for 1 year, and Texas University for 2 years, majoring in petroleum engineering. From 1936 to August 1942, he gained considerable experience with oil companies in Oklahoma and Texas. In August 1942, he went to Pearl Harbor, where he worked in construction for the United States Navy until August 1945, when he returned to the States. He joined Kobe in September 1945 as a junior engineer attached to the California division technical service. In March 1946 he was assigned to district operations in the Valley district of California, where his accomplishments earned him the appointment of district representative in the Rocky Mountain district in Colorado.

Kobe Promotes Lewis

Formerly manager of Kobe's Kansas district, J. T. Lewis has been made manager of the Oklahoma district. He has been a member of the Kobe organization since May 1942, starting in the shop in Oklahoma City. He was later transferred to the technical service department as a junior engineer, and in July 1943 to sales. He was promoted to Kansas district manager in December 1946.

Kruse Named Plant Manager

Harris Kruse has been appointed plant manager of the Newport, Pa., factory of Snap-on Tools Corp. Kruse, who has been associated with Snap-on since 1929, was formerly cost supervisor of the corporation's four plants. He is succeeded by Ray Baker, who previously headed the Kenosha plant cost department.

Fairbanks-Morse Announce Changes

Fairbanks, Morse & Co., Chicago, announces the following changes in their factory management organization.

W. H. Holbert, who for the past 20 years has been manager of the company's Stuttgart, Ark., works, has been appointed manager of the Three Rivers, Mich., plant succeeding Karl E. Barrett, who has resigned because of ill health.

J. R. Walsh, who has for several years been assistant manager of the Fairbanks-Morse Westco works in St. Louis, has been transferred to the Stuttgart works and has been appointed works manager of the company's plant in that city.

Howell Heads West Coast Sales

C. M. HOWELL

Charles M. Howell has been appointed petroleum sales engineer for the West Coast of Detroit Diesel Engine Division, General Motors Corp. Howell will establish local headquarters in California but will operate out of the company's petroleum industry sales office, at Tulsa, under the direction of Arch F. Campbell.

He graduated from Texas Technological College with a B.S. degree in mechanical engineering in 1937. During the war he participated in Mediterranean mine-sweeping operations with the Navy and was released from active duty in July 1946 after attaining the rank of lieutenant commander.

Howell came to Detroit Diesel in January, directly from Bethlehem Supply Co. of California.

New Los Angeles Branch Opened

Twin Disc Clutch Co., Racine, Wis., manufacturers of clutches and hydraulic drives, has opened a new branch sales engineering office in Los Angeles. The office is located in a newly constructed building at 2905 Leonis Boulevard, and serves a territory including California, Arizona, and Nevada.

Opening the Los Angeles office

brings the number of such branch engineering offices maintained by Twin Disc to eight.

All activities on the West Coast are under the general supervision of A. E. (Duke) Young, district manager. Sales functions of the California territory are under the direct supervision of Pierce Tyrrell, assistant West Coast district manager. Preston Olney, formerly field service engineer at the Dallas branch engineering office of Twin Disc, is manager of the new Los Angeles office.

National Supply Names Heywood

H. E. Heywood, a veteran of 35 years in the oil industry, has been appointed as manager, general sales office, of National Supply Co. at Toledo. He will assist in the over-all operation of the sales office and continue supervision of the inventory control department.

Heywood joined National Supply in 1923, taking charge of the East Tulsa warehouse and later became manager of the Tulsa store. He was assistant purchasing agent at Tulsa 1931-39 and was named manager of inventory control at Toledo in 1940.

Bethlehem Names Petroleum Machinery

Bethlehem Supply Co. announces the appointment of Petroleum Machinery Corp., 30 Rockefeller Plaza, New York, as exclusive export agents for Bethlehem Supply Co. rotary machinery, hoists, and pumping units.

Tri-Clover Names Metal Goods

Tri-Clover Machine Co., Kenosha, Wis., announces the appointment of Metal Goods Corp., 5239 Brown, St. Louis, as distributors for its complete line of corrosion-resistant products. This includes fabricated stainless-steel conical end, welding and recessed-end fittings for industrial liquid conveying line use in addition to Tri-Alloy and stainless-steel sanitary fittings and valves.

Metal Goods Corp. offers distribution facilities in St. Louis, North Kansas City, Tulsa, Oklahoma City, Dallas, Houston, Abilene, Beaumont, Fort Worth, San Antonio, New Orleans, Baton Rouge, Shreveport, Wichita, Denver, Omaha, and Memphis.

Terry to Represent Cameron

D. M. Terry has joined the sales department of Cameron Iron Works, Houston.

Terry is widely known in the Gulf Coast and Mid-Continent areas where has has been identified with the oil business for the past 17 years as a roughneck, driller, and later as service and sales representative for Halliburton Oil Well Cementing Co. and Baker Oil Tools. Terry is now stationed at Oklahoma City and can be reached at the Annex Courts.

S. R. Billingsley, left, sales engineer for Mid-Continent Supply Co., is congratulated by J. B. Kelly, sales manager of the Fawick Airflex Co., Inc., Cleveland, on Mid-Continent's recent acquisition of a contract giving exclusive distribution rights to Fawick clutches in all United States oil fields. J. E. Everroad, second from left, is general manager of Mid-Continent's diesel, machinery, and engineering departments. On the right is J. V. Eakin, district manager for Fawick at Dallas. Kelly came from Cleveland to acquaint Mid-Continent personnel with the Fawick Airflex Clutch during the company's annual sales meeting, held at the Blackstone Hotel recently. Billingsley will handle sales promotion for the product

Franks Manufacturing Names Kirberger

Earl Kirberger, one of Franks Manufacturing Corp.'s 15-year diamond-pin men, has been named to handle the Oklahoma and Kansas sales territory for the Tulsa rotary-drilling rig and servicing-unit manufacturer.

Kirberger is well qualified to handle the position. Having started with Franks in its early stages, he has been on the road before, both in the sales and service departments, and during the war worked in the production department.

Morse-Formsprag Department Formed

Frank M. Hawley, president of Morse Chain Co. Division of Borg-Warner Corp. and Chisholm N. Macdonald, president of Formsprag Co. of Ferndale, Mich., jointly announce the formation of the Morse-Formsprag sales department.

The Morse-Formsprag sales department will have headquarters at 7601 Central Avenue, Detroit. This new organization binds the precision manufacturing facilities of Formsprag Co. and the sales organization of Morse Chain Co. Morse-Formsprag has developed a completely new line of over-running clutches for industrial use. The new line of over-running clutches will supplement Morse's present line of mechanical power-transmission equipment now sold through branch offices and industrial distributors throughout the country.

Four Appointments in G-E Control Divisions

Four major appointments in the control divisions of the General Electric Co.'s apparatus department have been announced. M. H. Blesh was named manager of manufacturing; C. B. Bradish, manager of engineering, and E. A. Green, manager of sales. Thomas I. Hage has been appointed accountant for the divisions.

Pullman Returns From World Tour

Henry Pullman, export manager of Baker Oil Tools, Inc., has just returned to Los Angeles from an extended world tour for his company. Some years ago, Pullman was connected with Burmah Oil Co., Ltd.

Parker Appliance Names Standard Brass

Standard Brass & Manufacturing Co., Beaumont, has been named distributor for Parker Appliance Co., Cleveland.

Standard Brass will handle the complete line of Parker tube fittings, valves, and accessories for hydraulic and fluid-handling systems. Many parts will be stocked at Beaumont for immediate service to industrial users at the company's Port Arthur, Houston, Shreveport, and New Orleans branches, as well.

Standard Brass personnel will also be available for consultation on installation and service problems.

New "Tool Pusher" Group Formed

Following the first Tuesday morning meeting, last week, of the "Times Square Tool Pushers," comprised largely of members from the New York chapter of Nomads, it was decided to hold similar breakfast discussion groups each Tuesday at 9 a.m. Until further notice, these meetings will be held at the Savarin Restaurant in the Waldorf-Astoria, according to B. A. Hilliard, New York export representative.

In attendance at the first meeting were: Marvin Rasher, Sam Farrell, Jr., Frank Bergeron, Stu Beckley, Robert Elmore, Jeff Tucker, Tad Putman, G. M. Stewart, Howard Book, Floyd Olson, Jesse Hickman, Norman Yett, Ed Keenan, Taylor Bannerman, Kermit Kell, and Hilliard.

Rippie Joins Lukens Steel

Dr. Charles W. Rippie has joined Lukens Steel Co., Coatesville, Pa., as a member of its sales development staff. He will specialize in sales-development work on nickel, stainless, Monel, and Inconel-clad steels, with particular emphasis on their applications in the petroleum industry.

Previously, Dr. Rippie had been head of the technical service of the research and development division of Merck & Co., Rahway, N. J. He was also formerly associated with Shell Oil Co., Inc., with Solvay Sales Corp., where he was petroleum technologist; and with Monsanto Chemical Co.

Totco Expands Service

R. K. Palmer, field engineer, is now serving users of Technical Oil Tool Co. recorders for controlled vertical drilling in North Texas and South Oklahoma fields, with headquarters at Duncan. Hugh Weathersby is serving in the same field-engineering job in West Texas, and makes his headquarters at Odessa.

Rogers Returns From Middle East

Sam D. Rogers, president of Rogers-Ray Co., Houston, returned to Houston March 1 from a 6-week trip to Egypt. He flew direct from New York to Cairo to visit company crews who are working in Egypt, returning by way of London where he spent 10 days.

Rockwell Manufacturing Elects New Officers

At the annual organization meeting of the board of directors four new officers were elected by Rockwell Manufacturing Co., Pittsburgh.

J. E. Ashman was elected vice president and controller; E. W. Meyers is secretary, and M. J. Carl, treasurer. Paul A. Wick and I. C. Rowe were elected assistant secretaries. All other officers of the company were reelected.

New Company Formed

Announcement was made recently of the formation of Precision Equipment Co., Inc., manufacturers of stainless-steel and nickel and cobalt-base alloy valves, fittings, and machined products. General offices and plant are located at 1835 West 220th Street, Torrance, Calif., to serve the major oil refineries, chemical plants and aircraft factories in that area, although distribution of the company's products is effected throughout the Southwest.

Manager of the plant is H. J. McGuire, at one time foreman in charge of machine work at North American Aviation. With a background of over 12 years of machining stainless steel and similar alloys, McGuire has been associated with several plants in the Los Angeles area including Northrop Aircraft and National Supply. President of the company is Richard Gilman, graduate industrial engineer of Yale University, and manager of contract administration of Solar Aircraft Co. in San Diego prior to his association with Precision Equipment Co. The third officer, Warner Edmonds, Jr., a Stanford graduate, now practices law with the firm of Paul, Hastings and Edmonds.

Bailey Meter Assigns Field Engineers

Due to the demand for trained instrument engineers caused by post-war industrial plant expansion, Bailey Meter Co., Cleveland, is expanding its staff of field engineers. The company announces that the following assignments have been made:

H. E. Bitler to its Buffalo office in Ellicott Square Building.

M. J. Bonnette and R. W. Hooper to the Houston area with headquarters at 6539 Brompton Road.

J. W. Cunningham to its Atlanta office located at 184 Pryor Street.

H. G. Hilston to its Cleveland district office.

J. O. Meals to its St. Louis office in the Chouteau Trust Building.

L. W. Meier to its Los Angeles office at 1709 West Eighth Street.

J. R. Brennan, J. A. Hays, and R. P. Marche are remaining at the Cleveland main office where they will be attached to the engineering, research, and sales departments respectively.

Brown Oil Tools Names Potts

Ernest L. Potts has been appointed manager of the pipe-testing division of Brown Oil Tools, Inc., Houston.

Potts has had many years sales and engineering experience in the oil industry. He was with Halliburton Oil Well Cementing Co. for 7 years, 5 years as works manager of the Duncan plant and 2 years as assistant supervisor of mechanical research. During his career in the industry, Potts was also chief engineer for Sharp Deflecting Tool Co., and former Gulf Coast manager for Eastman Oil Well Surveying Co.

As manager of the pipe-testing division, Potts is in charge of pipe-testing operations. At present two portable hydrostatic testing units are in service for testing pipe, accumulating tanks, and other types of pressure vessels on location.

Rater Moves to Oil Base

Oil Base, Inc., Compton, Calif., makers of Black Magic oil-base drilling fluid, announces the appointment of Arch Rater, Jr., as service engineer. Rater will be stationed temporarily in California but later plans to work out of the Oklahoma City office as permanent representative for Oil Base, Inc., in the Mid-Continent.

Rater was formerly with Halliburton Oilwell Cementing Co., and Baroid Sales Division.

(Continued on page 165)

Classified Advertising

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1—40' dia. x 18' high, 3-Ring, welded construction with steel cone roof. Erected new 1943. Standing location McCook, Nebraska. Write for complete specifications.

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Caleo High pressure welded steel pipe for sale FOB Portland, Oregon. Asphalt dipped, perfect condition, 17,000 ft. 6 inch, 38,000 ft. 8 inch, 1,000 ft. 10 inch, all 12 gauge, 15,000 ft. 12 inch, 10 gauge, 25,000 ft. 16 inch 7 gauge. Also 220 Crane W.O.G. gate valves, sizes 6 to 16 inches. 267 fire hydrants and one wood stave reservoir, capacity 1,000,000 gallons. All in perfect condition.

Subject to prior sale.

Western Enterprise, Inc.
902 Cascade Bldg., Portland, Oregon.
Phone Tom Tatlam, Beacon 6688 or Beacon 4298

EQUIPMENT FOR SALE

FOR SALE: 6200' 24# 7" 3600' 5½" casing all one run. 3200' 2½" upset seamless steel tubing. 803 Tower Petroleum Building, Dallas, Texas. Telephone C-7667.

GEOPHYSICAL drill, can mount on your pickup in a few hours, ideal for core or shot holes to 300'. G. D. mud pump (3½ x 4) with suction hose, 2½" kelly with swivel and high pressure hose, chain pull-down, kelly guides in mast, double drum winch, oil bath rotary and Twin Disc clutches. Built by Republic Supply Co. and is like new. $2750.00. Waters Drilling Service, 69 Beacon Place, Pasadena 8, Calif.

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Located at Oklahoma City
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8,000 Ft.-1" }
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1—SA4500 Franks Skid Type Rotary Rig Complete with
1—FXZ 7¼ x 12 Gardner Denver Pump —New Liners—A-1 Condition.
2—HS600 Cummins 200 H.P. Diesel Engines—1 new, 1 overhauled.
1—Set Steel Walkway and pipe racks.
3,900'—New 3½" 13.30# Nat'l Tube Drill Pipe external upset internal flush—Hughes counterbore weld tool joints.
96'—Franks 100,000# portable derrick.
1—5KW Fieldlite Light plant—Dog houses—Tool boxes and everything to make rig complete—ready to run.

BRIDGEPORT OIL COMPANY, INC.
914 Central Bldg., Wichita 2, Kansas
Phone LD-244

STORAGE TANKS

2—10,000 Bbl. welded steel storage tanks ¼" & 3/16" thick. Offered "As is, where is" or knocked down, match-marked and loaded on cars, Brownstown, Ill.

1—10,000 Bbl., new, bolted steel tank. 7-10 gauge, crated with all appurtenances, New Orleans, La.

Large number of horizontal tanks for natural gasoline, bulk, Butane or Propane.

PETROLEUM EQUIPMENT, INC.
P. O. Box 867 Telephone 2-6291
Tulsa, Oklahoma

FOR SALE
STEEL STORAGE TANK

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